

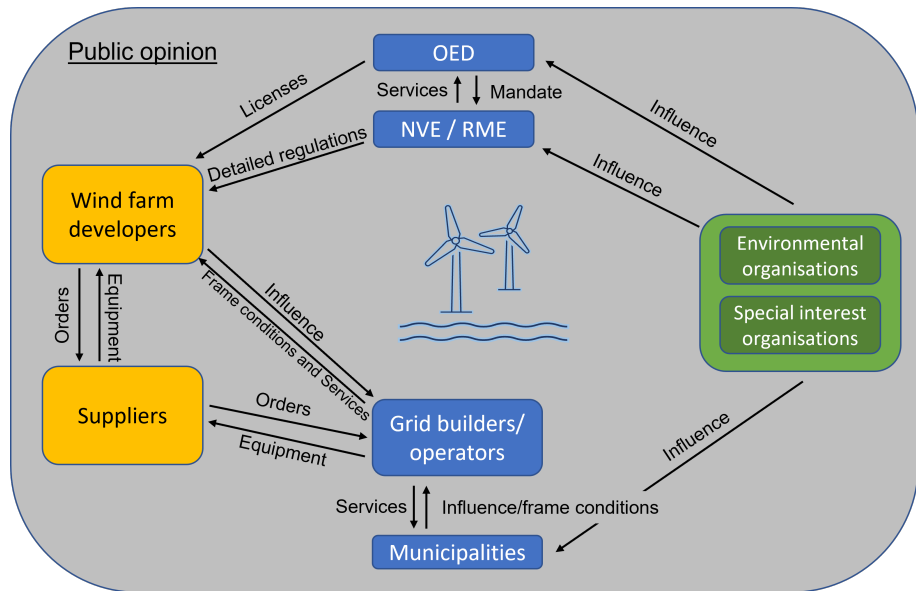
Christian Andre Andresen

# Stakeholder analysis with regards to large-scale North Sea offshore wind energy developments

Stakeholder objectives, drivers and barriers for large-scale offshore wind farm developments in Norwegian waters

Master's thesis in MORG  
Supervisor: Ruud Egging-Bratseth  
January 2023

NTNU  
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## **Abstract**

A stakeholder analysis focused on offshore wind farm developments in Norway has been conducted. The analysis aimed at mapping the relevant stakeholders, determining their objectives and main collaborating partners and investigating their perception of the main drivers and barriers for large scale offshore wind farm developments in Norwegian waters. The stakeholders were divided into categories, and data was collected by means of structured in-person one-on-one interviews with each identified stakeholder. The results show that the stakeholder landscape is large and includes many more actors than just the wind farm developers. This includes groups with prior interest in the areas affected by the developments, actors in the supply industry and wide groups of society such as electricity consumers, municipalities and environmental organisations. Main drivers for the development have been identified as value creation both for wind farm developers, supply industry and society as a whole as well as bringing more renewable energy into the energy system in order to meet the climate targets. Main barriers have been identified as potential area conflicts, lengthy and complex licensing processes, integration of intermittent power production and availability of equipment, raw materials and technology. Several stakeholders have reported the need for greater transparency in the licensing process, the environmental considerations done and the market design of the developments. The stated central rationale for the need for such transparency is the need for public support to the political processes needed for such large scale developments. Without long term political willingness large-scale offshore wind farm developments is not likely to be realised.

## Acknowledgement

I would like to acknowledge the support of my supervisor at NTNU Prof. Dr. Ruud Egging-Bratseth. We have had discussions on this topic over the course of more than one year, and his support and suggestions has been invaluable in the writing of this thesis. I find that his comments were insightful and frank, and I've appreciated his contributions.

I would also like to thank my college at SINTEF Sigrid Damman for her support on stakeholder analysis theory, and for taking time out of her busy schedule to help me.

All the people that I've interviewed also deserves gratitude. Nobody has been reimbursed for giving me their time, and it has been a overwhelmingly positive attitude in contributing to this work.

Finally, I'd like to than SINTEF Energi AS for supporting me in undertaking this work. I do believe that there has been a mutual benefit in the undertaking.

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## Abbreviations

**CfD** Contract for Difference.

**CO<sub>2</sub>** Carbondioxide.

**DSO** Distribution Service Operator.

**ENOVA** Governmentally owned entity working for the fulfillment of Norway's climate obligations.

**ENTSO-e** European Network of Transmission Service Operators - electricity.

**EU** European Union.

**FEED** Front End Engineering Design.

**HVDC** High Voltage Direct Current.

**KSU** Kraftsystemutredning (Power System Development Report).

**LCOE** Levelized Cost of Energy.

**M&A** Merger and Acquisition.

**MW** Mega Watt.

**MWh** Mega Watt hours.

**NGO** Non Governmental Organization.

**NHO** Næringslivets Hovedorganisasjon (The Confederation of Norwegian Enterprise).

**NVE** Noregs vassdrags og energidirektorat (The Norwegian Water Resources and Energy Directorate) .

**OED** Olje og Energi Departementet (Ministry of Petroleum and Energy).

**RCN** Research Council of Norway.

**RME** Regulermyndigheten for Energi (The Norwegian Energy Regulatory Authority).

**TSO** Transmission Service Operator.

**TWh** Terra Watt hours.

**UK** United Kingdom.

**UN** United Nations.

**UN SDG** United Nations Sustainable Development Goals.

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# 1 Introduction

This chapter gives a short introduction to the topic of this thesis and a motivation for why this is of interest to the author and potentially to the wider public.

The energy sector is on a threshold of fundamental and disruptive change. Some actors such as Statnett's Hilde Tonne claim that this shift has already started (Viseth, 2021) while others predict more rapid changes in the near future (Den Norske Regjering, 2022a). Motivated by the climate crisis and in particularly the climate goals by EU (Delreux and Ohler, 2019), Norway (Den Norske Regjering, 2022b) and major economies such as the US, Japan and China (Ministry of Foreign Affairs of Japan, 2022, The State Council Information Office. The People's Republic of China, 2022, The White House, 2022) the energy sector is in dire need of decarbonisation. Norway is committed to reducing the CO<sub>2</sub> emissions by 55% by 2030 and 90-95% by 2050 relative to 1990 levels. Although Norway is in a privileged position where most of the power consumption is covered by renewable emission free sources (87% by hydro power, 6% by wind power, 2% by nuclear power and 1% by other renewable sources in 2019 (Norges Vassdrag og Energi direktorat , NVE), this only covers about 50% of the energy consumption in the country. The remaining ~50% is covered by about 63% oil and 30% natural gas as the major sources (International Energy Agency , IEA). In addition to this, the present power surplus Norway enjoys in a "normal weather year" is predicted to turn to a power deficit within five years if no new generation is introduced and the consumption increases as predicted by Statnett (Gunnerød, 2022).

One of the major methods for the decarbonisation of a society is electrification. Norway has had a significant introduction of electric vehicles (Den Norske Regjering, 2022c). Today about 13% of all vehicles on the roads and 53% of all new vehicles sold are electric. However, so far this mainly covers cars for personal use and city busses only. Considerable amounts of electric energy are needed for the electrification of the remainder of the transportation sector. NVE has estimated that the electrification of all transport on road, rail and boat could pose an electricity demand in 2050 of 20TWh (Norges Vassdrag og Energi direktorat , NVE). Along the same lines, decarbonisation of other industrial sectors such as the building sector, process industry and service industry as well as utilization of electricity for new industries such as data centres and battery factories are foreseen to add

significantly to the future demand (Vassdrag og Energi direktorat , NVE). Some reductions due to energy efficiencies and better building standards are predicted, but the overall prediction is for a considerable increase in the overall demand for electric energy. Statnett quotes an increase from the present  $\sim 145$ TWh/year to a high scenario of  $\sim 220$ TWh by 2050 (Statnett ASA, 2022).

There has been a major debate concerning potential new power sources such as onshore wind and new hydro power in Norway (Bård Amundsen at Forskning.no, 2021). Presently no new onshore wind power plants are being built in Norway, and the potential for extracting more power from the hydro power plants are limited (Graabak et al., 2017). Among the other alternatives there are some potential from solar energy plants in Norway (Good et al., 2014) and to a lesser degree from other sources such as micro-hydro power plants, geothermal power plants and wave power plants. Offshore wind on the other hand holds a vast potential for energy generation both in Norwegian waters, in Europe and globally (Norges Vassdrag og Energi direktorat , NVE).

Some offshore wind power plant developments have already been installed, and considerable developments have been sanctioned. As of 2020 Netherlands has installed 2460 MW, Belgium 2262 MW, UK 10383 MW and Germany 7774 MW offshore wind farm capacity (IRENA, 2022). However, offshore wind power is still expensive compared to onshore wind power and other renewable and non-renewable sources. This is especially the case for floating wind power . The cost of such developments is however reducing rapidly, and learning effects are expected to bring the Levelized Cost of Energy (LCOE) down even further (Johnston et al., 2020). The first developments are expected to generally be the most expensive per MWh. It is therefore an interesting question how to create incentives for the development of offshore wind power in an efficient and socio-economic optimal manner. A starting point for such an endeavour could be to study the roles and objectives for the stakeholders in these developments as well as the drivers and barriers they themselves identify.

In addition to the potential for generating renewable energy, there is a potential for Norway to build a supply industry based on the construction of offshore wind farms with associated infrastructure, operational and maintenance needs and profits form energy ex-

port. The potential has been identified as 4-11 billion Euro per year by Næringslivets Hovedorganisasjon (NHO) for the supply industry alone (Norsk Hovedorganisasjon , NHO). This has partly been the motivation behind the Grønn Platform initiative of which the Research Council of Norway's (RCN) is one of the larger backers (Norges Forskningsråd , NFR). Under this initiative the project *Ocean Grid* has been awarded for the period 2022 to 2024 (SINTEF Energi AS, 2022). The main objective of the project is to ensure profitable development of offshore wind farms in Norwegian waters. The author of this thesis leads two work packages in this project focusing on quantitative market analysis and future market design. This thesis is written as an independent work from the project, but at the same time in parallel to the market modelling work in the Ocean Grid project, and several of the stakeholders included in this work are also partners in the project.

The aim of the thesis is to give a qualitative assessment of the stakeholder roles and interactions and the drivers and barriers they identify. This is seen as complementary to the more quantitative studies using modelling tools that are often applied in the field of energy system analysis.

The structure of this thesis is as follows; First Chapter 1 gives an introduction to the work and the setting it is performed in, secondly Chapter 2 gives the problem formulation, research questions and scope limitation for the thesis. Chapter 3 gives a brief overview of the theoretical foundation for stakeholder analysis and market design utilized in this thesis, and Chapter 4 gives a description of the methodology utilized. Chapter 5 presents the main findings from the work performed and selected topics are discussed in more detail in Chapter 6 before the major conclusions are given in Chapter 7. Suggestions for further works and possible improvements to the work and results presented in this thesis are given in Chapter 8. All the interviews that have been conducted during the work with this thesis have been individually and anonymously summarized in Appendix A.

## 2 Problem Statement

This chapter will give a presentation of the problems to be studied in this thesis, alongside some limitations in the scope. Concrete research questions that will be addressed towards the end of the thesis are given below.

The study of the stakeholders in the development of offshore wind energy in the North Sea and other Norwegian waters has a broad interest from several perspectives. From an **environmental perspective** there are at least two possible angles to look at this development. Firstly, there is a need for a rapid introduction of massive amounts of sustainable and emissions free energy in order for the world to meet its zero emission targets and reduce the climate changes that will result from failing to do so. On the other hand, a considerable development of offshore wind energy will have a potentially adverse effect on the marine environment and the actors harvesting these. Also, there is a need to look at these developments holistically in order to determine their total life cycle footprint. From an **economic perspective** the development of offshore wind energy also has at least two angles. Firstly, this will allow for the generation of large amounts of power either to be sold as a commodity to Norway, to Europe or a combination. It will also potentially allow for the development of a supply industry in Norway that may develop a home market and use this to enable exports globally. Again, there is the potential adverse effect on the parties that today exploit the offshore resources such as fisheries and (perhaps to a lesser degree) offshore petroleum industry. It is also interesting to look at the **sociological perspective** of the consequences of these developments. The envisioned development is of such a scale that it will impact the energy supply situation for Norway, the supply industry and the lives of those that use the ocean space today. It may therefore (depending on solutions chosen) influence such actors as Norwegian households through energy expenses, municipalities through potential required land usage and possibilities for establishing new industries, Norwegian industry in general through availability and cost of electricity and the Norwegian government through taxes and energy security.

As noted in the Introduction, Norway is projected to run into a power deficit in about 5 years if no new generation is implemented and the projected consumption trend is realised. This may result in considerable higher energy prices for Norwegian consumers.



The implementation of offshore wind energy may alleviate a considerable share of this challenge if substantial developments can be realised. One of the underlying questions for this thesis is **how to ensure that such a development is profitable and sufficiently desirable for a sufficiently large number of stakeholders so that it is realised**. As an example, the development will require both the wind farm infrastructure itself and the transmission infrastructure to transport the power (or some other energy carrier, such as hydrogen) to the consumers. In a setting where these two infrastructures are to be built by different stakeholders, there need to be sufficient incentives for both of them to build their part for the overall development to be undertaken. This may require cooperation where one or both stakeholders may be forced to implement a sub-optimal solution seen isolated from their perspective. The perspectives of the various stakeholders with regards to the objectives and roles of the other stakeholders are therefore interesting. Also, the identified drivers and barriers for each stakeholder are important for the realisation of these developments.

This thesis will study a selection of stakeholders relevant for the profitable development of offshore wind energy. The focus of the study will be on the offshore part of the development, and the socioeconomic effects of the developments. Although such developments from a system perspective are often judged by its overall socioeconomic surplus or deficit, there are arguments for a more detailed study of distribution effects. A project giving a socioeconomic surplus may cause undesired distribution effects (such as higher power prices for households) that may make it politically undesirable even though there could have been constructed mechanisms to rectify these undesired effects.

The following research questions (RQ) have been formulated for the thesis:

**RQ # 1:** Who are the relevant stakeholders for offshore wind energy developments and what are their roles?

**RQ # 2:** What is the objective for each of the stakeholders and which entity sets these objectives?

**RQ # 3:** Who does each stakeholder see as their closest cooperation partner(s) in such a development?

**RQ # 4:** What does each stakeholder see as the major drivers and barriers for the successful realisation of large amounts of offshore wind energy generation?

The thesis is limited in scope to answer the Research questions specified here. It is also limited to evaluating the responses from the interviewees that have been selected for interview. The only addition is openly available information such as from the OED website. The answers have been reported as they have been given, and no effort has been made to quality check, verify or contrast them either during the interviews nor after. As such the thesis debates the given statements from the interviewees as they stand.

Answering the research questions above will map the landscape of offshore wind energy development stakeholders and clarify their objectives. Being able to systematically list and analyse the presence and objectives of the relevant stakeholders enables an understanding of the potential for competition and cooperation between these objectives. Going further in the analysis and mapping the stakeholders own opinions on the interaction between them will allow for the generation of a stakeholder network mapping. Comparison between the stated objectives and the identified drivers for offshore wind farm development will be interesting for assessing the alignment between them. Finally, the identification of barriers for these developments from each of the stakeholders could reveal overlap or contrasts between types of stakeholders. This may act as an input to the development process in general, and the formulation of the regulation for offshore wind energy that is currently being made.

If these questions are answered and clarified, a more efficient, profitable, socioeconomically optimal and sustainable offshore wind energy development may be realised. This will act towards the UN Sustainable Development Goals (UN SDG) 7) Affordable and Clean Energy, 9) Industry, Innovation and Infrastructure, 13) Climate Action and 14) Life Below Water. If the thesis could only in a very limited manner help raise the awareness of the role of each stakeholder, help align objectives and reduce barriers for the development of this important renewable and emissions free energy source that would justify its existence.

## 3 Theory

In this chapter a brief outline of the underlying theory for the work presented later in the thesis is presented. First a brief introduction of power market theory is given, and thereafter some theory and related works with regards to stakeholder analysis in this context is given. A more detailed power market description is given in Appendix B.

### 3.1 Brief power market introduction

Electric power is bought and sold as an openly traded commodity in several different markets with different time horizons and geographical distributions. The spot market is of greatest interest when it comes to the discussion of offshore wind power production. The power is traded in different bidding zones. Each bidding zone is connected to other bidding zones for import/export. An overview of some European bidding zones can be seen in Figure 1. In general, the price in each bidding zone is determined by how much production and consumption is available in the zone and how much import/export is possible at which price. A zone with a power surplus (higher production than consumption) will have a lower power price than a zone with a power deficit (lower production than consumption). Transmission capacity between two zones will even out the price and given sufficient capacity between two zones the price in these two zones will be equal.

The price a producer obtains for the produced power in the spot market is depending on which bidding zone the producer is located in or connected to. As the power price varies over time and between bidding zones, it is therefore of great interest to offshore wind farm developers which zones they will be connected to. Since much of Europe is connected into one large system with a considerable number of connections the behaviour of this system and the resulting prices are formed by a very complex set of interactions and are very hard to predict. The offshore developers in the North Sea are therefore also affected by the deployment of other renewable power sources (onshore wind, hydro power and solar), thermal power production and consumption changes in the rest of Europe.

A more detailed explanation of the price formation can be found in Appendix B.

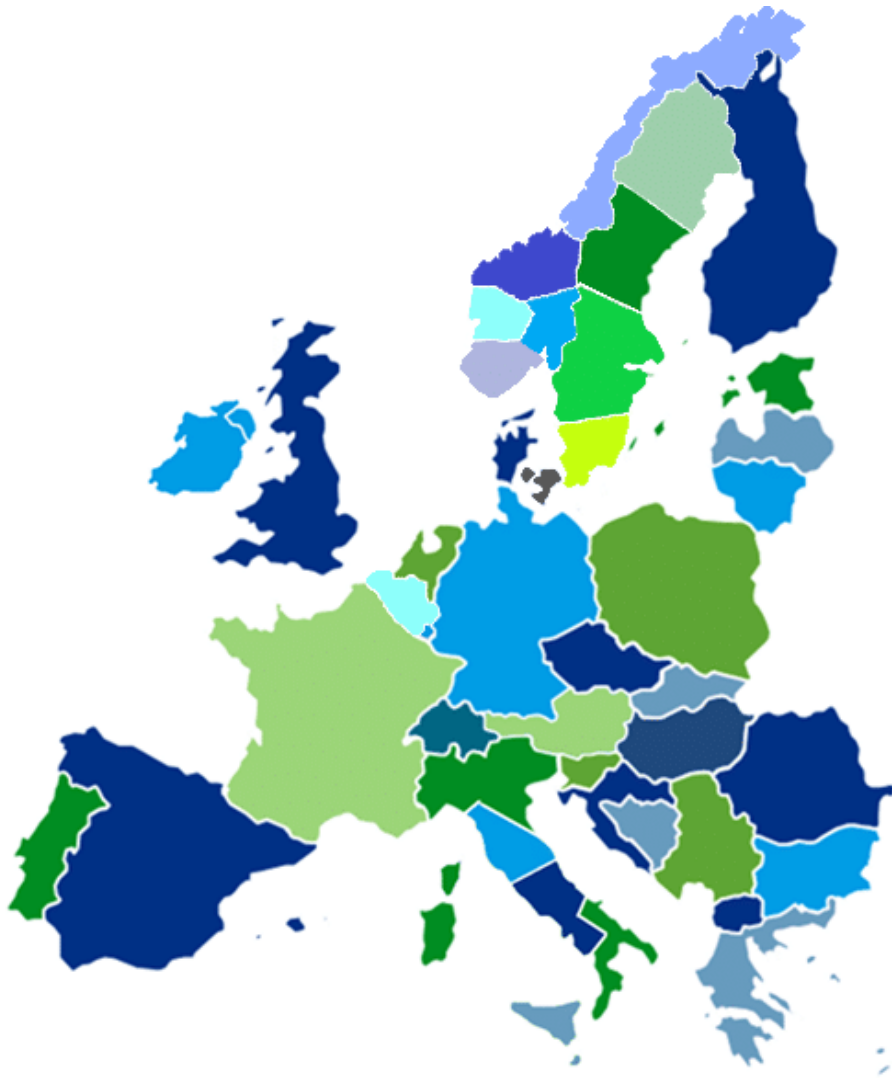


Figure 1: Illustration of the European bidding zones. The figure is sourced from The Florence School of Regulation (Florence School of Regulation, 2022)

## 3.2 Stakeholder theory

This chapter defines what is meant by *stakeholder* in this thesis and gives some background onto which the methodology and results are built upon. The term "stakeholder analysis" has become increasingly popular over the last few decades, both in academic publications and elsewhere. A search for *Stakeholder Analysis* at the on-line database Web of Science ([www.webofscience.com](http://www.webofscience.com)) returns 1586 results with a clear increasing trend as seen in Figure 2. It is clear that the utilisation of this methodology is increasing, or at least this term is used increasingly to describe what has been done in the literature. The dip in the last data point is attributed to the fact that this is for the year 2022 and the query was done in November 2022 so the full year has not passed.

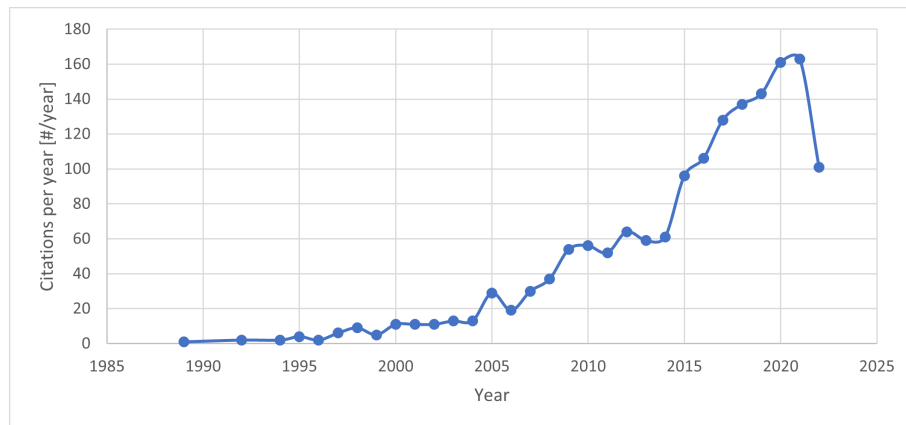


Figure 2: Results from a search of the phrase *Stakeholder Analysis* in the on-line database Web of Science.

### 3.2.1 Stakeholder definition and scope limitation

The field of stakeholder analysis (and the publications associated with this) gathered much momentum in the late 1980's / early 1990's as shown above and also reported by Laplume (Laplume et al., 2008). One of the distinctive works that sparked this trend was the book *Strategic Management: A Stakeholder Approach* of R. E. Freeman in 1984 (Freeman, 1984) where a rich description of the stakeholder approach is given. In this book Freeman gives a definition of a stakeholder seen from an organization's point of view as follows:

A stakeholder is any group or individual who can affect or is affected by the achievement of the organization's objectives.

An alternative definition was given by Clarkson (Clarkson, 1995), and this is in the authors view more appropriate for the scope of this thesis:

Stakeholder are persons or groups that have, or claim, ownership, rights, or interests in a corporation and its activities, past, present, or future.

Clarkson further classifies the stakeholders as *primary*: essential to the survival of the organisation or *secondary*: not essential but having interactions. There is no clear and strict boundary between these two categories, and some of the stakeholders covered by this thesis may be regarded as boarder-line whereas others fall clearly into one or the other.

In order to make the definition of a stakeholder more specific to the objective of this thesis (wind farm development) a stakeholder will be regarded as any entity that affects or is affected by the development of offshore wind farms. Here, *entity* could be understood in a wide sense, but I limit it to organizations such as wind farm developers (for example Hafslund Eco), grid developers (for example Statnett) or regulators (for example NVE). Within each organization there are of course individual persons that are themselves stakeholder, but unless explicitly stated *stakeholder* will refer to the organization within which these persons work.

A stakeholder analysis could also be conducted by looking at various stakeholders *within* an organisation. That could be individuals, departments or categories of employee (clerks, managers, sales personnel). There could be interesting insights derived from such an analysis regarding the policy formation and functionality for each organisation. However, this falls outside the scope of this thesis, and only inter-organisational aspects will be studied.

It could also be argued from Freeman's original definition that groups can be understood as a wider set of organizations and/or individuals such as *people harvesting from the ocean* or *electricity consumers* should be included. Here this is represented by organisations such as *Norsk Fiskarlag* or *Forbrukerrådet*.

As with any theory and approach, stakeholder analysis cannot answer all questions, but is rather targeted at studying specific aspects of a development such as offshore wind farms. Specifically stakeholder analysis is suited to

- *Get an overview of the relevant stakeholders for any given process:* A structured process of mapping out which stakeholders are relevant for a given development could reveal novel insight into the landscape of actors, and give new insight into the strategic process of realizing a process objective. There are several ways of obtaining such an overview. The works by Bergek *et al.* (Bergek et al., 2005) outline a methodology for this that includes looking at industry associations, patent analysis, bibliometric analysis and interviews/discussions. This methodology has been utilized in this report in order to form a set of organisations to interview.
- *Map the objectives of different groups of stakeholders:* Doing structured work on mapping out the objectives (open and hidden) of a range of actors relevant to the process at hand may reveal patterns and new insight into the underlying motivation of the different groups of actors. There are several ways of obtaining the objectives of an organisation. This includes looking at the organisation's own material such as its webpage, annual report or founding charter. It may also include interviewing individuals in the organisation (as done in this thesis) and asking other entities that interact with the organisation what is the objectives of a given organisation (also done in the context of offshore wind farm developers). The two first approaches may reveal mostly what the organisation *wants to portray* as their objectives, and the latter approach may reveal what are the perceived objectives as seen from other stakeholders' perspective. There may be differences between the portrayed and the perceived objectives (Van Audenhove, 2019).
- *Identify conflicts and opportunities between groups of stakeholder:* The understanding and structured presentation of the objectives of relevant stakeholders may reveal both conflicts of interests and potential synergies. The conflicts could potentially jeopardise the process while the strategic alignment of objectives could secure a more effective realisation.

- *Potential for reducing undesirable side effects of the process:* The mapping of each stakeholder's interests in a process may reveal unintended detrimental side effects of the process or other detrimental effects that can or must be mitigated for the successful completion of the process. Early identification of effects and consequences, and strategy development to mitigate any detrimental outcome is important as this may be more costly or time consuming at later stages in the process.
- *Mapping the stakeholder landscape may reveal a need for strengthening or restructuring groups carrying out dedicated processes:* The identification of relevant stakeholders, their objectives, their interdependencies and how they are linked towards other entities in society may reveal the need for changing a group and/or its conditions for it to achieve its objectives. This could be done by enlarging a group that is to carry out a process by bringing in new competence, knowledge or permissions, restructuring the group so that there is less conflict of interest and more synergies, or seeking to legitimise the group's activities with other stakeholders such as regulatory entities or the population in a given area.

### **3.3 Applicability of stakeholder analysis to the case**

Although the above list of points where stakeholder analysis can be useful contains many positive and productive points for securing the successful completion of processes, there are areas where stakeholder analysis falls short. Varvasovzky and Brugha (Varvasovszky and Brugha, 2000a,b) have written a *to-do-and-not-to-do* and a review article discussing strengths and weaknesses of stakeholder analysis. Although this work is largely written in the context and perspective of and health care sector, many of the considerations regarding the methodology carries over to the offshore wind farm development case treated in this thesis.

Regarding the data collection methodology, there are several methods of doing this. There are quantitative (gathering financial data, considering staff sizes and types, exchange of commodities between stakeholders for example) and qualitative approaches (interviews, variations of literature reviews and variations of observation for example).

The interview is in this context regarded as a qualitative approach. Interviews could



be quantitative, for example if quantitative answers were given to a set questionnaire, but this is more related to data gathering). Interviews could be based on a questionnaire, but also in the context of focus groups or informal discussion groups. It could also be done face-to-face following a strict or semi-structured route of questioning. This can help data gathering. There is however the potential pitfall that a too strict regime of questioning with too limited questions will limit the degree to which the interviewee gives access to the information the person holds. Keeping a sufficiently broad focus allows the interviewer to uncover hidden or emerging themes that would not come up under a more structured interview. It is therefore important to let the interviewee to some degree steer the interview in order to build connection, trust and interest enough to share information that would otherwise be difficult to obtain through other methods.

In this context Teams meetings (virtual meetings) are regarded as face-to-face since some of the same interaction between interviewee and interviewer is established as in a physical meeting. A physical meeting would give the possibility of a closer interaction, potentially causing more information exchange. However, the recent developments in virtual meeting facilities and the degree to which people have become accustomed to these meetings does in the author's experience allow for a considerable degree of connection.

### **3.4 Results analysis perspectives**

The answers given by the representatives for the various stakeholders must be interpreted and compared with other answers. It is also important to have a sufficient appreciation for the fact that the perception of the interviewer (the author in this case) may differ from what was intended to be communicated by the interviewee. The interviewer may understand a different message than what was intended from the interviewee even though the same words were used and exchanged. The results are here reported in English, which is not the mother tongue of the author nor of any of the interviewees. However, the interviews were conducted in Norwegian which is the mother tongue for the interviewer and for the majority of the interviewees. The original notes and the analysis was done in Norwegian to minimize *loss in translation*.

It should also be noted that the cultural context that the work is done within and

the familiarity of the interviewees with such methodologies could influence the results. It may be the case that the interviewees have hidden agendas or have other underlying causes to —not give forthright responses and shape their answers to further their agenda (Varvasovszky and Brugha, 2000b). This would diminish the usefulness of the analysis. The possibility of cross-referencing the stated objectives and other statements by the interviewees to some extent diminishes this risk but does not remove it. The collection of responses from more than one organisation for each organisation category also diminishes the risk of erroneous analysis.

Several methodologies and authors (Clarkson (Clarkson, 1995), Brugha and Varasovszky (Varvasovszky and Brugha, 2000a), Berkek (Bergek et al., 2005)) report on quantitative analysis and sorting or arranging of stakeholders by their relative importance. This is often done when the stakeholder analysis is utilised from the perspective of a given organisation, and with an underlying purpose of securing the successful completion of this organisation’s objectives. This could for example be done by a structured survey (may be subject to sampling bias), database searches (may be limited in scope/applicability) or through financial data. The purpose of this thesis is to map the stakeholder landscape for the development of offshore wind farms as a holistic undertaking, and not only from the perspective of the wind farm developers as may be seen as natural. No such quantitative nor importance ranking has therefor been done. The illustration of the stakeholder interactions and the discussions later in the thesis nevertheless lends itself to deducing relative importance of the various stakeholders.

### **3.5 The temporal validity of the analysis**

An analysis such as the one presented in this thesis is just a snapshot of the present state of the stakeholder landscape. Different processes take place in different stakeholder landscapes (sets of stakeholders and frame conditions) that vary with different time constants. The offshore energy sector is in tremendous development, and both the set of stakeholders active in the field and the frame conditions are changing rapidly. The results from such an analysis must therefore be read in the context of which time it is written, and what was the setting in the sector at that time.

Even though the landscape is changing over time, my perception is that some common stakeholder positions (such as conflicts of interest and synergies) will remain the same over time. It is also my perception that there are lessons to be learned from other energy-development processes (such as onshore wind farms, hydro power developments and nuclear facilities) that may have transferable value to offshore wind farm developments and also between such developments in different parts of the world. This perception builds on the observation that there are stakeholders that utilise areas (such as fishers, farmers, hunters and recreational groups) that have a very long temporal perspective, and they will most likely continue to have their interest in these areas over considerable time horizons. The potential conflict associated with the utilisation of areas for other purposes than what they have traditionally been utilised for has a shared core regardless of the areas being onshore or offshore. There is a potential for conflict if the land is to be utilized for wind farms, hydropower, nuclear power plants or any other activity requiring area.

When performing a stakeholder analysis it is of course important to consider the context in which the analysis is conducted, and this includes the time period. A stakeholder analysis of onshore wind farms may have given different results before and after the recent relatively sharp changes in public perception in Norway that occurred over only a few years. An analysis of the offshore implications of onshore wind developments have been conducted by Dahl *et al.* (Dahl et al., 2022).

The duration it takes to perform the analysis must be shorter than the timespan in which the stakeholder landscape or important frame-conditions change in order for the analysis to be consistent. If this is not the case, special attention must be made to the changes occurring during the analysis. This analysis is carried out in the context of a Master thesis, spanning roughly one year. In the view of the author, no changes have occurred during the performance of the analysis that are significant enough to impact its validity. This should not be interpreted as a claim that there has not been changes in this field. As seen by some of the stakeholders there may have been multiple developments, and some of the changes may be regarded as major changes. The field of offshore wind farm development is in rapid development, but the underlying positions and roles of the

stakeholders have not qualitatively changed. This is not to say that this statement will be true for every time interval of one year going forward. As the offshore wind farm developments are beginning to near construction and implementation phase, it may well be that the roles and perceptions of several stakeholders change more rapidly. This may be particularly true for the public opinion as has been observed for onshore wind farm developments.

## 4 Methodology

This chapter outlines the methodology utilised for the work performed in this thesis. This builds on the theory presented in Chapter 3 and elaborates on this.

A number of published sources present methodology for performing stakeholder analysis. Either as part of a larger study or as an activity in and of itself. There is a number of steps that the author has found to be reoccurring in the works. The outline of the methodology given below builds most heavily on the works by Bergek *et al.* (Bergek *et al.*, 2005) and Varvasovszky (Varvasovszky and Brugha, 2000a).

- Plan the analysis: determining thematic scope, overall methodology, geographical and time scope, intended audience.
- Identify the stakeholders: Determine whom to source information from using the chosen methodology.
- Perform the data gathering: Utilize the chosen methodology on the selected stakeholders and record the gathered data.
- Analyse the data. Do structured analysis in order to answer the scope set out.
- Present the results. Present the findings that have been made so that the intended recipients can utilize them.

It is of course important to note that this is seldom or never a strict one-way process where one starts at the top and goes through the points to the end. It is rather more often an iterative process where there is a need to go back and update the points above with new information or perspectives as the analysis proceeds. For example, the data gathering stage may reveal shortcomings in the stakeholder identification stage that necessitates expansion of the list.

The context of the analysis is detailed in Chapter 1 Introduction and Chapter 2 Problem Statement. It has been limited geographically in scope to the offshore wind farm developments in Norwegian Waters. These are however tightly connected with the European developments so these cannot be ignored. The vast majority of interviewees are

from Norway (only one foreign TSO has been interviewed as there is only one Norwegian TSO), but many of these actors have international scope and close collaborators. The time scope has been selected as studying the perspective of how to successfully implement large scale offshore wind farms for the future given the present status. No or little retrospective analysis is done outside some comparisons with lessons from onshore wind farm developments.

The selected main methodology for this work is the mapping and interview of central stakeholders in the offshore wind power sector. Some related works in this field are presented in Chapter 6 Discussion, but the author has not found any works presenting studies directly comparable work to this. This analysis is done in the context of a Master's thesis within the NTNU Videre program, the work is primarily performed solo by the author and not by a team. The work has been well supported by regular meetings and discussions with the supervisor that has helped guide the work. In the two works referenced at the start of this chapter the cultural context of the analysis is given some attention. It is pointed out that if the analysis is done across cultural boundaries, it is particularly important that the impact of the background and behaviour of both the interviewer and interviewees is well understood. In this context the interviewer and the interviewees share a common cultural background, and this has facilitated efficient and frank (from the point of view of the interviewer) discussions. In every interview the interviewer has disclosed that he is an employee of SINTEF Energi AS, and thus an independent actor in the field without affiliations to any of the other stakeholders. In the opinion of the author this has also helped gain access to interviewees and facilitated an open and frank discussion.

Several approaches could have been selected for such a stakeholder analysis. In this work one-on-one interviews with stakeholders directly involved in the offshore developments have been selected. Alternative approaches include mapping, classification and assessment of stakeholder interactions without direct interaction with the stakeholder or comprehensive analytical studies of a selection of stakeholders with regard to their ability to work towards a given objective. These studies include a strategic mapping of stakeholder's interests, resources, positions and their capacities to mobilize these resources (Crosby, 1993). Such an analysis could also have been conducted using focus groups

(Hammel et al., 2013). After evaluation of the different types of approaches the one-on-one interview approach was deemed the most applicable by the author. This is due to the closeness of the interaction (allowing for direct follow up of nuances in the answers), the prior knowledge of the sector by the author (allowing for relevant question formulations and rapid understanding of the answers given), the fact that the information gathering, and analysis is done by the same person and the flexibility of the process. The interviews have been conducted guided by a set questionnaire that the author has used to guide the discussion with the representatives for the various stakeholders. The questionnaire has been kept constant for all interviews even though the stakeholders varied considerably (i.e. from governmental institutions to supply industry for offshore installations). As a consequence of this, the questions are not role specific, but rather general in order to shed light on the research questions outlined in Chapter 2 Problem Statement.

Since the questions are for the most part subjective in nature (in that they do not have quantitative or otherwise directly comparable answers) and that the replies from the interviewees are not reproduced directly, a drawback of this methodology is that the results are to some extent dependent on the interviewer and my interpretation of the results. The methodology also relies on to which degree the selection of stakeholders is representative, access to representatives of these stakeholders and the interaction between myself as an interviewer and the interviewee.

Efforts have been made to make a representative selection of stakeholders and to make the interviewing procedure objective. The selection of the stakeholders has been made after reviewing studies of interested parties in the sector, see sub-section 5.1 for details.

In the following section the interview questions utilized in the interviews are given. In Appendix A the response from each interview is summarised and the questions have been repeated there for ease of reading.

## **4.1 Interview questions**

The following interview questions (IQ) have guided the interviews:

### **Description of roles and objectives for the stakeholder**

**IQ #1A:** What is the overall role of your organisation in the offshore wind power sector?

**IQ #1B:** What is the objective of your organisation in this future development?

**IQ #1C:** Who determines the objectives of your organisation?

### **Drivers and barriers for large scale offshore wind development**

**IQ #2A:** What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?

**IQ #2B:** To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization.

**IQ #2C:** What do you and your organisation see as the major barriers for the development of large scale offshore wind power production

**IQ #2D:** How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are?

### **Cooperating and competing stakeholders**

**IQ #3A:** Which other stakeholders do you see as cooperating partners for achieving your objectives.

**IQ #3B:** Are there stakeholders opposing your achievement of your objectives.

**IQ #3C:** To which extent is public opinion relevant for the choices of your organisation and shaping your actions.

## **4.2 Interview organisation and process**

After the selection of the relevant stakeholder organisations, as described in Chapter 5.1, individuals in each organisation were identified. This was done by searching the organisation's webpages or other available information about the relevant sections/departments and the contact persons there. A request for interview was sent with information about



the purpose included. Often there were some rounds of clarification and redirecting before an individual were identified. After the identification of a relevant individual was done a Teams-invitation was sent out with the interview questions attached so that the interviewee could prepare.

The interviews were conducted via Teams-meetings. Duration of the interviews were 45 - 60 minutes. Notes were recorded in writing during the interviews, and this acted as a foundation for the summaries given in Appendix A. No audio/video recording was made of the interview. The interviewee was assured that the interview was anonymous and informed that a summary of each interview would be made public. Neither the name of the individual nor the organisation would be reported. Both the lack of recording and the anonymity was done in order to make the individuals speak more freely.

Since there is a limited number of actors in the Norwegian context there is the possibility that both the organisation and the individual would be identified through the answers given. For example, there is only one Norwegian TSO, and the questions regarding roles and objectives may reveal the nature of the organisation interviewed. This was deemed acceptable by both the author and the interviewees as this was discussed during the relevant interviews.

## 5 Results

This chapter presents the results from the utilisation of the methodology presented in Chapter 4. First the stakeholder identification is described, then the interview results are described and lastly a presentation of the results for the research questions posed in Chapter 2 is given.

### 5.1 Stakeholder Identification

The entities selected for interview in this stakeholder analysis are based on a study of independent sources mapping which parties would have an interest in the development of offshore wind farms. The main sources are;

- *Samarbeidsforum for havvind* - forum organized by the Norwegian government
- *Norwegian Offshore Wind* - cluster for offshore wind development
- *Senter for hav og Arktis: Marine næringsparker* - report on maritime industrial potentials

Although the above list of sources of interested parties is not comprehensive it is evaluated to be sufficiently extensive for the purpose of this thesis. It is judged as sufficient because they all aim at covering a wide set of actors in the maritime/offshore sector and the energy sector in particular and their difference in profile. The *Samarbeidsforum for havvind* is an entity organised by the ministry, the *Norwegian Offshore Wind* cluster is an initiative backed by commercial actors and the *Senter for hav og Arktis* is led by an university. It is unfortunately beyond the scope of this work to interview all parties mentioned in the sources, and a selection had to be made. In the process of selecting which stakeholders to interview, efforts were made in including a variation between the stakeholders representing potentially different interests. For example, both wind farm developers, suppliers, fisheries and environmental organisations were included as it is reasonable to expect that they hold different perspectives and objectives from one another. In the same manner both private companies, public entities and NGOs were included.

Finally, a larger number of offshore wind farm developers were included because the author was interested in any potential diversification in their view. This is founded in the research questions, as the offshore wind farm developers and their approaches to their tasks are viewed as central to the overall development of offshore wind energy generation in Norwegian waters. Even though internationally there have been offshore wind farm developers for some time, this is a rather new set of actors in Norway and they may be more diverse in their formation phase. In Table 1 the main categories of stakeholders have been listed. Note that environmental organisations and special interests' organisations have been split in two different categories even though they both promote special interests (as environment could be seen as a special interest). This is done since the environmental organisations have a special role in this context, and because other special interests' groups (such as fishing organisations and energy generation organisations) speak on behalf of specific parts of society with vested and often commercial interest in their particular field.

- *Environmental organisations* - various organisations that have as their main objective the protection of the environment
- *Special interests organisations* - various organisations that have as their main objective the promotion of special interest groups such as fisheries or house owners
- *Grid operators* - organisations that have as their main objective the building and operation of electric grid infrastructure and associated markets (not gas grids). In Norway this includes the TSO, Statnett, and about 120 DSOs.
- *Wind farm developers* - organisations that have as their main objective the building and operation of offshore wind farm developments. Often these also has other energy generation assets onshore.
- *Suppliers* - organisations that have as their main objective to supply the wind farm developers with equipment (such as wind mills and platforms) and services.
- *Regulators* - organisations that have the regulatory responsibility in this context. Here also including the licensing authority. In Norway for this context the Ministry

of Petroleum and Energy (OED), the Norwegian Water Resources and Energy Directorate (NVE) and the Norwegian Energy Regulatory Authority (RME) are the central entities.

The categories of stakeholders interviewed are given in Table 1 together with examples of entities in each category and the number of interviews conducted for each category. Note that there is only one interview in the regulators category. This is partly because there are not that many entities to interview in Norway, and partly because the request for an interview with OED was not replied to. However, the position of OED is to a large extent public, and they have extensive documentation made available through their web pages and in other communications that they disseminate. The OED have set up web pages<sup>1</sup> with a Q&A section that answers some of the questions relevant for this thesis. On this page OED lists the main objective for developing offshore wind farms as being the need for renewable industry to Norwegian industry and households and the opportunities for industrial developments in Norway. OED also describes conflict reducing measures with respect to the fishing industry, the licensing process, which field studies they are performing and some arguments behind the rationale for choosing to award 30 GW offshore wind farm licenses by 2040. OED cooperates broadly with many different stakeholders in their work with offshore wind energy. Among the initiatives that OED have taken for securing this dialogue is the *Samarbeidsforum for havvind* where 60+ organisations have been invited<sup>2</sup>. These include both wind farm developers, environmental organisations, supply industry, grid developers/operators, fishing industry and labour organisations.

There is also only one interview in the supply category. This is a rather homogeneous group of actors in terms of organisation structures (often privately owned) and objectives (often generating profits for the owners), and thus one interview was deemed sufficient.

The organisations listed in Table 1 are examples, and the actual organisations interviewed are not necessarily the ones listed. There is an overlap between the list of example organisations and interviewed organisations, but the latter one has not been listed in order

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<sup>1</sup><https://www.regjeringen.no/no/tema/energi/landingsider/havvind/sporsmal-og-svar-om-vindkraft-til-havs/id2910617/?expand=factbox2910623>

<sup>2</sup><https://www.regjeringen.no/no/aktuelt/olje-og-energiminister-terje-aasland-inviterer-til-samarbeidsforum-for-havvind2/id2947723/>

to protect the anonymity of the interviewed parties. The Norwegian offshore environment is not very large and listing specific organisations would make identification of persons easier.

Table 1: Overview of interviewed organisation categories, some example organisations and the number of organisations in each category interviewed.

Organization category	Examples of organisations	Number interviewed
Environmental org.	Norges Miljøvernforbund ZERO WWF Bellona	2
Special interest org.	Huseiernes landsforbund Energi Norge Forbrukerrådet Norsk fiskarlag NAF	3
Grid operators	TSOs (Statnett, Energinett DK, Fingrid) DSOs	4
Wind farm developers	Hafslund ECO Equinor Deep Wind Offshore Fred Olsen Seawind Aker Offshore Wind	3
Suppliers	Aker Solutions ABB NEXANS	1
Regulators	NVE RME Finanstilsynet	1

## 5.2 Interview results

The statements from the interviewees were as described documented in writing during the interviews and a summary of each interview can be found in Appendix A. Each interview was guided by the interview questions presented in Chapter 4. However, as the vast majority of the interviewees were passionate about this topic, their answers were often covering aspects of multiple questions and tangential to the given question being debated. Often questions down the list would be answered at an earlier stage. When writing up the summaries the answers have been grouped under their relevant interview question.

The results reported below have all been drawn from the answers of the interviewees in response to the questions. In Chapter 1 Introduction and Chapter 2 Problem Statement I have given some background and some previously obtained insights into the topic of offshore wind farm developments. There is a large degree of overlap between what was written there and what is reported below as answers from the interviewees. There is a good agreement between the background given in the Introduction/Problem Statement chapters and the results reported here when looking at the overall points raised. There are however nuances and diverging opinions that are interesting and surprising to the author and potentially to readers of this report. More detail on these points of the results is given in Chapter 6 Discussion where selected results are discussed in more detail.

## 5.3 Stakeholder interaction

The categories in Table 1 is a response to Research Question #1 (RQ#1: Who are the relevant stakeholders for offshore wind energy developments and what are their roles). The organisations are clustered based on information from the sources utilised for the selection of organisations (see Section 5.1) and on the replied from the interviewees. The interactions between the stakeholders are illustrated in Figure 3. This figure aims at answering RQ#1 schematically.

It was found that most actors have a broad basis of interaction, but that most of them interact extensively with organisations of the same type in a collaborative manner. It was also found that many organisations are influenced by the public opinion. Those that are not directly affected are indirectly affected, mostly through their owners that are more

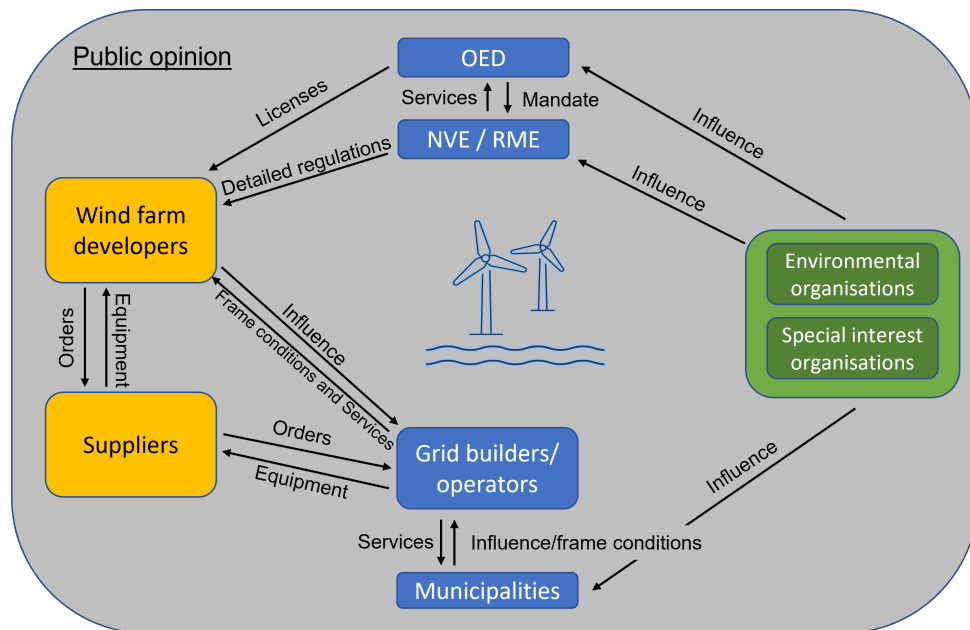


Figure 3: Schematic presentation of the key identified stakeholder categories and their interactions. Note that OED and NVE/RME are specific entities and not categories. However, they constitute in this context the licensing and regulating authorities.

directly affected by the public opinion. For stakeholders that based their decisions on evidence based objective studies the public opinion affected them more in which topics and questions they were evaluating rather than their opinion on those topics and questions. An example of this is the focus and amount of time NVE spent on onshore wind farm developments before and after the strong public opinion shift on this topic in the recent years.

There are also differences in the way each stakeholder affects their cooperating partners. For example, OED gives mandate to NVE, whereas NVE gives services back to OED for example in the form of studies and detailed regulation of the operators. This has been included in the figure with labelled arrows.

## 5.4 Stakeholder objectives and roles

Regarding the objectives and roles identified by each organisation there was for some categories a difference between the objectives/roles that the organisations identified for

themselves on the one hand, and the objectives/roles that other stakeholders perceived them having on the other hand. Mostly this was true for the more commercial actors in the *wind farm developer* and *supplier* categories. Below follows a category-by-category summary of the roles identified by each organisation.

- *Environmental organisations* - These organisations quoted the need for protecting the environment and fighting climate change as their main objective. In this respect their role is to advocate good solutions, influence relevant decision makers and the public at large and scrutinize the developments taking place. There were no opposing opinions to the objectives and roles from any of the other stakeholder categories.
- *Special interests organisations* - In contrast to the above mentioned environmental organisations these organisations have the explicit objective and role of promoting special interests for select parts of society. Similarly, to the environmental organisations, the special interests organisations do this by influencing decision and law makers, grid companies and the public opinion. Again, no opposing opinions were raised by the other categories.
- *Grid operators* - These organisations all reported to be strongly influenced by directives from the regulating authorities that set their objectives, and all reported their main objective to be the socioeconomic optimal creation and operation of the grid. There were some differences between the DSOs (mostly concerned about the construction and operation of their regional grid) and the TSOs (concerned about the transmission grid, but also to a large extent about the market solutions). Their role is the construction and operation of grids (distribution or transmission), ensuring security of supply, equal treatment of actors and, for the TSOs, the balancing responsibility. Also here there was little or no deviation between the objectives and roles stated by the organisations themselves and the ones stated by organisations in other categories.
- *Wind farm developers* - The wind farm developer organisations all reported their role to be both developing offshore wind farms and operating them over time. Their



objectives were generally reported to be multiple in nature. Most highlighted the desire to introduce large amounts of renewable energy and building a value creating supply chain in Norway. They also report the objective of profits for their owners, but the majority portrait this as being a subordinate objective to the production of renewable energy to help mitigate the climate crisis and the generation of jobs. This is in strong contrast to the situation portrayed by most of the stakeholders from the other categories. Most stakeholders from other categories report the desire for profit as the most important objective, and in some cases as the only objective for the wind farm developers. Also the long term perspective stated by the developers have been called into question. This may stem from the experience reported by some interviewees that some projects have been sold on by the initial developers while under development and prior to construction<sup>3</sup>.

- *Suppliers* - These organisations sees their role as supplying the wind farm developers with equipment and services. In a wider context they see their role as providing jobs and value creation to the nation. The one supplier that was interviewed reported that the objective was to make profits for their owners. This was nuanced by stating that the perspective of the organisation was that this was most effectively done in cooperation with local stakeholders, by creating value for society and by turning the organisation into a sustainable zero-emission entity. There were some remarks from organisations from other categories that they believe that the suppliers are mostly driven by profit and less by social or sustainability considerations.
- *Regulators* - The regulator reported that their objective was to ensure a socio-economically sound and secure energy supply to Norway, facilitating value creation in a sustainable and environmentally friendly manner. Their role is to award licenses, make regulations and suggest and help uphold laws in a neutral, objective and knowledge-based manner. There were few opposing views from the other categories. There was however one interviewee that was very critical to their operation, and stated that the regulator has a lack of neutrality, fact based decision making

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<sup>3</sup>Please see interview number 2 and 3 in Appendix A.

and an undue favoritism of profit over sustainability. Critical evaluation and debate surrounding the numbers utilised by the governmental organisations can for example be found published in *Miljømagasinet* (Løberg and Nilsen, 2019) which is a publication published by Norges Miljøvernforbund.

## 5.5 Stakeholders reported closest partners

Each interviewee was questioned about their closest cooperating stakeholders. The specificity of the answers varied quite a bit. Some stakeholders reported that they had done structured stakeholder analysis and had a conscious focus on whom they cooperate with. Others did not report this, and an impression was left that they cooperated with whomever they saw fit for each case at hand. A general trend was that each stakeholder cooperated strongly with organisations of the same type, for example there was a strong DSO network interaction and an extensive cooperation between special interest organisations even though they represent different special interest groups. At the same time the majority of the stakeholders reported that they have cooperated with the regulating body and spent time and effort influencing the law makers. An overview of the stakeholder landscape showing how entities influence each other and their co-dependencies is illustrated in Figure 3 with arrows indicating the direction of each interaction and its nature.

It must be noted that the sample (number of interviews) size is quite small for each category, however the collective response is more robust than results for each category. The findings reported above are based to a large degree on the collective response of all the interviews. Several stakeholders report the interaction with the local municipalities as important cooperating partners. This was not only commented on by the grid companies and the regulators, but also by several of the wind farm developers, the suppliers and the interest organisations (both special and environmental).

## 5.6 Drivers and barriers identified by the stakeholders

Most of the time during the interviews was devoted to the discussion of drivers and barriers for large scale offshore wind farm developments. This was also the topic among the interview questions that sparked the most enthusiasm and engagement from the interviewees.

wees, and where the opinions regarding other stakeholder categories were most prominent and strongly worded. A deeper discussion of these topics is conducted in Chapter 6, but a brief overview of the major drivers and barriers is given below:

- *Drivers:* The two major drivers identified were profit and energy production. The profit perspective was given in some different variations. First and foremost, many identified the desire among the wind farm developers to make a profit as the major driver, but also the value creation for society and the construction of a supply industry was often mentioned. All these value creation perspectives have been repeatedly reported in the interviews. The energy production driver also has several aspects. The most often identified one is the need for more renewable energy in order to reach our climate targets. This is also the case for Norway. Even though nearly all Norwegian electric energy comes from renewable sources such as hydro and wind power, only about half of the energy consumption is electric and the non-electric demand is often met by fossil fuels. This need is much more pronounced in Europe. The avoidance of a power shortage in the near-term future was also often identified as a large driver as well as the need to secure cheap and reliable electric energy for Norwegian industry. There were also claims that one of the major drivers was the desire to *greenwash* the power production in Norway<sup>4</sup>.
- *Barriers:* A number of barriers was identified. The most prominent ones were the lengthy and complex licensing and approval process for offshore wind farms, conflicts regarding the utilization of areas already utilized by other stakeholders, environmental concerns regarding the impact on the local ocean space and the overall footprint of the construction and operation of these large infrastructure developments, infrastructure needed for the utilization of the generated energy (ocean grid and land grid) and the intermittent nature of the wind production causing a demand for balancing power and/or user flexibility. In addition to this, the development and rapid scaling of a supply industry capable of delivering and operating/maintaining these large infrastructures was seen as difficult. An associated barrier is the availability of

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<sup>4</sup>Greenwash = portraying an activity as more environmental friendly than it is in reality

the raw materials such as metals and minerals needed. As these are often heterogeneously distributed geographically the availability may be made difficult by growing geopolitical tensions. Some interviewees also reported that the present LCOE was too high and that there was a need for more research and development to bring this down and to iron out some technical difficulties. These were however seen as manageable if addressed properly.

A further discussion on the results is conducted in Chapter 6 where a deeper analysis on selected topics is conducted. The interviews also contained questions regarding such topics as the probability of reaching the offshore wind targets, alignment between objectives and drivers for each stakeholder, opposition to the overall development of offshore wind and influence of public opinion. As these topics are better suited for a more elaborate presentation with evaluation of the findings, they will be presented and discussed in Chapter 6.

## 6 Discussion

This chapter discusses some of the topics that were reoccurring in the interviews and where more in-depth discussion and evaluation is needed. This includes a debate on the overall opposition to the offshore developments, supply chain and material availability issues, stakeholder collaboration, licensing issues and issues related to the introduction of large amounts of intermittent power into the future power system.

### 6.1 Opposition to the overall development of large scale offshore wind farms

Very few stakeholders reported that they or any of their closely collaborating stakeholders directly opposed the development of large-scale offshore wind farms. Only one organisation reported that they directly opposed the developments, this was one of the environmental organisations. This stakeholder strongly claimed that such developments will not have a beneficial environmental effect, rather the opposite. The stakeholder also drew into question the facts presented by several other stakeholders that were identified by name and the objectives and methods utilised by the wind farm developers. The claim was that the environmental motivation presented by the wind developers and other organisations were just a front used as an excuse to gain economic profit. In particular the utilization of subsidies was described as a *subsidies party* for the developers financed by the tax payers.

There was only one stakeholder that went this far in calling into question the motivation and objectives of the wind farm stakeholders that stand to profit from the developments. However, even though this one stakeholder went much further in claims than the others interviewed, there was a call for greater openness regarding the consequences of the developments from several stakeholders. Both the environmental organisations and the special interest organisations in particular called for greater transparency and more studies to be conducted. This concerns the overall environmental impact of the development (Life Cycle Assessment), the impact on marine life (in particular fish) and the impact on societies along the coast. The fact that the Norwegian offshore wind farm developments will take place further north than many of the developments that are used as an empirical basis for

resource needs, performance, environmental consequences and longevity was underlined. There may be issues and special conditions in the Norwegian waters that significantly differ from developments further south such as in the North Sea<sup>5</sup>. Greater insight into these issues was called for by several stakeholders, and this united some of them in a joint cause for increased scrutiny of the developments. There is, based on these interviews, a need for transparency in these studies (including methodology/assumptions, modelling framework, data sources and actual data sets) in order to make them credible for a broad range of stakeholders.

The main opposition body outside the ones interviewed was identified as the organisation *Motvind* (<https://motvind.org/>). Several interviewees identified this as the major opposing actor. This is an organisation with the explicit objective of stopping all wind farm developments in Norway. It was commented repeatedly that this organisation is very active, but has limited influence on decision making.

There was stronger opposition by organisations having dedicated interests in the areas that will be affected by the developments than by stakeholders that did not have such interests. These organisations were not against the developments in and of themselves, but rather protective of their own interests. Several stakeholders raised the need for dialogue and the mapping of consequences in order to minimise or remove any adverse impacts for their interests. It was also from their side repeatedly underlined that there is a need for an open and transparent factual basis for the developments. Having local involvement and buy-in was identified as a key requirement for reducing the level of conflict in the developments. In the view of the author people are more likely to support a development if they see a direct need and benefit for themselves. This could be in the form of economic benefit directly, jobs or better energy supply in this case. Having large foreign ownership and exporting the energy will diminish the support of the general public. This view is to a large extent aligned with the findings by Lundheim *et al.* (Lundheim et al., 2022) that have studied the social acceptability of wind energy. In their work the concept of Not-In-My-Backyard-ism is argued to be outdated and that the support or opposition

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<sup>5</sup>An overview of wind farms in the North Sea can be found at <https://windeurope.org/intelligence-platform/product/european-offshore-wind-farms-map-public/>

to wind farms can be categorised into *psychological variables*, *contextual variables* and *personal resources* categories.

## 6.2 Supply chains and material availability

The vast development plans for offshore wind farms both in Norway and in the EU will require massive amounts of equipment and resources. This was identified as one of the major barriers for successfully reaching the targets set by the nations around the North Sea. There are two aspects within this challenge that reoccurred.

The first was that the number of suppliers for the offshore wind farm equipment is limited and that it will take time before the strong surge in demand results in a surge in the supply sector. Increasing demand for the equipment and competence needed will drive up prices and result in long delivery times. It was identified that having good planning processes and sufficiently attractive projects would increase the likelihood of realising the ambitions. Attractive projects were described as projects of a large enough size and with sufficiently low risks for suppliers. This directly ties into the licensing processes that may pose risks to the developments and postpone investment decisions.

Secondly there is the question of availability of the raw materials and the technology needed. Europe may need to source much of the raw materials from outside the continent for this development. This may become more difficult both because other continents are ramping up their own renewable production (scarcity of resources globally) and because the geopolitical situation may lead to more restrictive export policies. On an EU level there are initiatives to become more independent in this regard (European Commission, 2022). Also, with respect to available technologies there may be future challenges. Some of the technological solutions needed are not yet available and need to be developed, and others may need to be imported. The already constructed offshore wind farms demonstrates that the technologies for building offshore wind farms are available. However, the planned scale of new development not only requires that single wind farms can be build and connected to shore. It will most likely also require a higher level of interconnectivity between the wind farms themselves and the onshore power system. The apparent dilemma between fundamental technological solutions being available but at the same time needed

development is well described in the summary of IEAs *Net Zero by 2050* report (IEA: International Energy Agency, 2021).

There is a large degree of consortium building among the actors in the offshore wind farm sector in order to position themselves for bidding on licenses. One of the criteria that is considered when building these consortia is the access to the right technologies either internally or through collaboration with suppliers.

### 6.3 Stakeholder collaboration

All stakeholders reported to have a large degree of collaboration with other stakeholders in the sector. Most of the stakeholders reported other stakeholders from the same category as their closest and most frequently utilized collaborator. In particular the special interests' organisations and the grid companies reported a close interaction between organisations from the same category. There was a large number of stakeholders that interacted with the public bodies OED/NVE/municipalities in order to influence decision making and get approvals/licenses for various operations.

The interaction with the public both through listening to the public opinion and through directly interacting with local organisations/communities was raised by most stakeholders. This includes both grid companies, wind farm developers, suppliers and environmental/special interests organisations. It was observed through the interviews that there is a realisation within the various stakeholders that the public opinion matters, even though this may be centred around the opinion of a local community surrounding the stakeholder. Local opposition to projects or operations is seen as dangerous and a potential risk to reaching the objectives of the organisations. It is also identified by the wind farm developers that having local support and local interaction/value creation will give a competitive edge in the licensing auction to come <sup>6</sup>. Stakeholder interaction is therefore consciously shaped to include local stakeholders.

An interesting observation is that none of the special interest organisations highlighted influencing the wind farm developers as a central task. Mostly their influence was towards

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<sup>6</sup>A licensing round for offshore wind farm license is expected from OED in the first quarter of 2023: <https://www.regjeringen.no/en/aktuelt/regjeringen-gar-videre-i-sin-satsing-pa-havvind/id2949762/>



lawmakers/regulators, the public or grid companies.

## **6.4 Licensing processes and 30 GW by 2040**

All the stakeholders interviewed were asked about their view on the likelihood of having 30GW awarded by 2040 in Norwegian waters and 150GW operational by 2050 in other parts of the North Sea as per the Esjberg declaration. Some stakeholders abstained from assessing the likelihood because they had not done any studies or because they referred to their independent status in the matter. However, after some debate, almost all interviewees mentioned political willingness and bravery in some form as being needed for realising these goals. It is important that the licensing processes are clear and open, and that they are not too lengthy. There needs to be a clarity in which legislation that applies, clearly defined and distributed roles and responsibilities and clarity on who is to build and own/operate which infrastructure and have the rights to each revenue stream.

A potentially lengthy and unclear licensing process was highlighted by several interviewees as the greatest threat to building offshore wind farms in Norwegian waters within the stated ambitions. In addition to the delays and complexities for the actual developments, this was seen as part of a larger picture. If Norway is to build large offshore wind farms in competition with European and global actors building in other waters, there is a need for a firm and predictable process that can be trusted by the investors. Getting a first mover advantage by developing a supply industry and gaining operational experience can be crucial for the future value creation in Norway. Not only regarding the energy generation (both for domestic and export purposes), but also in building a supply industry capable of exporting to Europe and a service industry able to offer competitive services. It may be too late to gain a first mover advantage in offshore wind farm development on the whole, but there are still positions to be gained in floating wind farms and other yet to be developed sectors of the industry (Bento and Fontes, 2019).

It is therefore important that the political willingness is present over sufficiently long time spans to see these developments through. This will require consistency over time spans that are longer than one election cycle in Norway (4 years). This will not be possible if there is a strongly divided public opinion on the matter that may shift the

political position frequently towards 2040/2050. Identified mitigating factors for avoiding this are openness around the process, solid and transparent consequence studies and LCA analysis, local benefits from the developments, raised awareness regarding the need for more renewable energy and open and early dialogue with other interested parties in the affected areas.

## 6.5 Integration of intermittent power production

The Norwegian plans for awarding 30 GW offshore licenses needs to be seen in context with the existing power and energy system of Norway and Europe. 30 GW wind production capacity is close to the overall hydro power production capacity of Norway today. One of the major differences is that a large part of the hydro power production is not intermittent whereas the wind power production is. This means that the wind farms will produce electric power only when the wind is blowing and there is therefore a need for balancing power to meet demand in periods when the wind is not blowing (and there is no other renewable source generating sufficient power). Extended periods of low renewable production has been termed *Dunkelflaute* (Li et al., 2021), and is of increasing concern as intermittent renewable sources start to constitute the majority of the electricity supply.

The ability of Norwegian hydro power to supply flexibility and balancing power is large, but it is not endless. If the offshore wind farm capacity exceeds that of the entire hydropower system, at some point there will be a need for other ways of keeping the power balance or other utilisation of the peaks of the wind power (such as pumped hydropower or hydrogen production). If insufficient flexible resources are available, then there will be more severe fluctuations in availability and price of electric energy. Alternative flexibility resources can for example be storage technologies (other than hydro power) or demand flexibility. The demand flexibility can be industrial consumption that can be shifted or reduced dependent on availability or household consumption such as heating or EV charging.

The development of offshore wind farms will most likely therefore affect the end consumers. If the development does not take system perspective into account, there may be adverse consequences such as the excessive need for balancing power. This point was

raised by grid builders/operator and special interest organisation representing end consumers. As such these stakeholders attempt to influence law makers and regulators in order to minimise the adverse consequences.

Even though the offshore generated energy will most likely be tied into the transmission grid operated by the TSO, there will be consequences for the distribution grid built and operated by the DSOs as well. Firstly, the overall power balance will impact the operation of the distribution grids, and the balancing/flexibility sources may be located in the distribution grid if they are sufficiently distributed. This will impact the operational pattern and strain on these grids and have consequences for DSOs and local communities. Secondly, the foreseen supply industry supplying equipment and the service industry for the wind farms may be located along the coast and be tied into the distribution grid. This will impact municipalities and local communities along the coast.

Again, there needs to be openness and transparency in order to build trust and secure a stable public awareness and acceptance of these changes. It is also important that both pros and cons of the development are highlighted and documented. It was stated by several stakeholders that local commitment and support is strongly dependent on local benefits from the developments. This includes both utilization of the power production, a share of the value creation of the generated power and local activity connected with the developments.

## **6.6 Impact on the distribution grid**

Although several interviewees (and both the DSOs) commented that large scale offshore wind farm developments will most likely be tied into the transmission grid, and thus fall under the TSOs area of responsibility, there are still impacts on the local distribution grid. One aspect raised was (as discussed above) the integration of intermittent power. Another aspect also raised was that these developments will need to be supported by a supply- and service-industry that will most likely be connected to the distribution grid operated by the DSOs. This may cause a strain on the local grid, need for further investments and areal conflicts. This situation is amplified by the electrification of the transport sector. it is unclear when or if the offshore service vessels can be electrified, but this overall challenge

may need to be taken into the grid development plans for the local DSOs.

## 6.7 National benefits from the developments

As has been reported above the local benefits from the offshore developments have been raised repeatedly. In a wider context the benefits for the nation from the exploitation by industrial actors of national resources (such as ocean space) has come under debate recently such as in the *grunnrenteskatt* debate for fisheries<sup>7</sup> and an updated tax regime for the hydro power producers<sup>8</sup>. Norway has had a socioeconomically beneficial tax regime for the petroleum sector built on the premise that these resources are national resources that some industrial actors may exploit, but at a high tax rate (Bang and Lahn, 2020). It could be argued that the exploitation of ocean space for wind energy production should fall under the same regime. It is however not likely that the wind production will be as profitable as the petroleum sector, and the tax policy must also take sufficiently into account the need for investments and development of the sector.

## 6.8 Findings from related studies

In the work by Wever *et al.* (Wever et al., 2015) a stakeholder analysis is performed on a case in Germany where offshore wind energy is high on the agenda. The focus of the work is the potential conflict between wind farms and other utilisation of the ocean space such as fisheries. The work was conducted in part through the utilisation of stakeholder workshops. The paper concludes that there is a clear need to find sustainable, resource- and space-efficient solutions for combined ocean use. It also highlights that there is a willingness to find such solutions among the policy makers and the research community. In order to reduce the potential levels of conflict stakeholder dialogue between a wide range of stakeholders is recommended. The generation and efficient transmission of knowledge within different stakeholder groups is seen as important for the future.

Comparing the situation between Germany and Norway, there may be greater potential

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<sup>7</sup><https://www.regjeringen.no/no/aktuelt/grunnrenteskatt-pa-havbruk/id2929113/>

<sup>8</sup><https://www.dn.no/innlegg/skatt/statsbudsjettet-2023/kraftmarkedet/toppskatten-pa-vannkraft-gjor-det-ulonnsomt-a-investere-i-kraftverkene-vi-trenger-mest-fremover/2-1-1341351>

for coexistence in Norwegian waters due to a much larger ocean space per capita. In the view of the author the findings do however carry over as the area conflicts described are similar to the ones that are emerging in Norwegian waters. In line with the findings in the thesis, fact based and open knowledge, dialogue and a well-designed licensing process is key to minimising the potential conflicts.

The Swedish offshore wind developments, and in particular the opponents of this have been studied by Waldo (Waldo, 2012). In-depth interviews have been carried out with more than 40 stakeholders. The stakeholders included individual people living close to the development sites and representatives of local organisations as well as politicians and the developers themselves. Overall, there was strong opposition to the developments. There was however no evidence of the NIMBY-syndrome<sup>9</sup> that has been reported by some of the interviewees in this thesis. The opposition was by Waldo found to be of a more general nature such as a belief that wind power is inefficient and unprofitable. In addition, the adverse impact on the landscape was highlighted as an argument against offshore wind farms. Waldo also concludes that the position of any individual has a complex composition, but that there is generally a strong correlation between cognition and feelings. The paper concludes:

Our analysis shows that in the persons interviewed, there is a high degree of consistency between cognition and feeling in relation to the wind power projects; a negative feeling about the landscape impact of wind power is accompanied by the belief that wind power is inefficient and unprofitable when compared with other energy sources, and not least with nuclear power. Likewise, a positive feeling toward wind power is accompanied by a belief in its positive environmental effects.

Again, this supports the need identified in this thesis for transparent and fact-based debate and dissemination of research results to a wide audience. It is in the opinion of the author encouraging that fact-based insight into developments may alter the feelings

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<sup>9</sup>Not In My Backyard-syndrome. <https://www.britannica.com/topic/Not-in-My-Backyard-Phenomenon>

of individuals about these developments. The public opinion may therefore be shaped by fact-based communication surrounding offshore wind farm developments.

A case study from Scotland has been reported by O’Keeffe (O’Keeffe and Haggett, 2012) where potential barriers of offshore wind energy have been studied. A series of in-depth semi-structured interviews was conducted with a wide range of stakeholders including developers, governmental agencies, local interests organisations, fishing organisations and environmental organisations. A number of obstacles to the developments were identified, and they include inadequate renewable energy support mechanisms and insufficient grid infrastructure. The work points at a more inclusive approach to stakeholder engagement including sharing of knowledge as means to overcome these challenges. The study concludes that public opinion is not expected to pose problems for the particular offshore wind farm case studies. However, the fishing industry is anticipated to pose a major challenge to the developments. This may be a nuance of the findings in this thesis where the stakeholders stated that they are very concerned with the public opinion, and that the relation with the fisheries could more readily be solved through sufficient dialogue.

## 7 Conclusion

This chapter summarises some of the main findings organised with reference to the research questions given in Chapter 2.

RQ # 1: Who are the relevant stakeholders for offshore wind energy developments and what are their roles?

The main stakeholders has been identified into five categories. In addition to the wind farm developers there are the supply industry, the special interests organisations, the environmental organisations, the grid building/operating organisations and the law making/regulating organisations. The categories alongside their major interaction pattern are illustrated graphically in Figure 3.

RQ # 2: What is the objective for each of the stakeholders and which entity sets these objectives?

In general the commercial actors (wind farm operators and suppliers) have value creation for their shareholders and the community at large as an objective in addition to their stated objectives of increasing the supply of renewable energy. The objectives of the environmental and special interests organisations are to a large degree set by their members and in favour of these members. The public entities (grid builders/operators and regulators) generally have optimisation of a sustainable socioeconomic surplus as their main objective and this is set politically.

RQ # 3: Who does each stakeholder see as their closest cooperation partner in such a development?

Each stakeholder reported that they have a number of collaborating partners, and that in particular they collaborated extensively with organisations of the same category. In addition to this most stakeholders quoted close interaction with the regulating parties and influence from public opinion (either directly or through political or shareholder governance) as important.

RQ # 4: What does each stakeholder see as the major drivers and barriers for the successful realisation of large amounts of offshore wind energy generation?

The main drivers were reported as value creation and the need to increase energy production in general to avoid a national energy deficit and renewable energy production in particular to meet climate targets. The main barriers identified were lengthy licensing processes, environmental concerns, the intermittent nature of the wind energy and supply chain challenges.

It was observed that the stakeholder landscape related to offshore wind farm development at the scales in the stated ambitions both for Norway and Europe is quite large. These developments are of such a scale that they cannot be seen isolated from the rest of the energy system. They are large enough to substantially impact the price formation of energy, the supply industry along the Norwegian coast, the national overall value creation and the marine environment where they are to be constructed.

It is therefore a joint national challenge to review these developments holistically and in a proper system perspective. Each wind farm cannot be evaluated individually, the system consequences need to be studied and addressed. Several stakeholders reported that a successful development can only be achieved through cooperation between all interested and affected parties, with transparent processes and fact-based open debate in society at large. Everybody in Norway (and Europe) will be impacted by this development in some way as energy security becomes ever more important. There is therefore a need for a trust building approach to this development where both the overall socioeconomic perspective at a national/continental level *and* distribution effects on individual groups and citizens are taken into account.



## 8 Further Work

The present study can be improved upon in several ways that are unfortunately outside the scope of this work.

- The stakeholder selection can be extended. In the literature (Bergek et al., 2005, Varvasovszky and Brugha, 2000a,b) the *snowball effect* is discussed where interviewing one stakeholder about the stakeholder landscape leads to the identification of other relevant stakeholders not yet included. By iteration the landscape grows. At some point this converges and the number of stakeholders reaches a limit. One such iteration was done in this work by attempting to contact OED as suggested by one stakeholder. Further pursuing this strategy could lead to a richer landscape and potentially other categories than the ones reported on in this thesis.
- The number of interviews could be increased. This differs from the above point in that the first point would look at categories of stakeholders not yet included, this point would focus on extending the number of organisations within each category. The limited scope of this work only allows for a limited number of interviews per category, and there is a diversity in each category that is not captured in this work. New insight may be gained from this, but it is the opinion of the author that this will be more of a nuanced nature than completely new categories of for example drivers or barriers. In this thesis there are several statements claiming *several stakeholders have stated* where the number of stakeholders are not given. This is done consciously as the number of interviewed stakeholders is so small that it is not numerically representative for the overall joint group of stakeholders. Giving a percentage of stakeholders that mentioned a given claim would give a false basis for comparison and not reflect the underlying uncertainty in the data foundation. Having such statistical distributions may be beneficial for example in helping to guide any conflict mitigating actions towards issues the majority of stakeholders identify as important.
- Several stakeholders report the need for transparency and neutral consequence studies in order to build trust in the mutual benefit of the offshore developments. This

thesis does not outline *how* this is to be done efficiently and robustly. Nor has there been a discussion of who would be the best entity or entities to perform this work and by which methods this could be obtained. In the view of the author full agreement and alignment will never be achieved, but there is a potential and a need for better alignment than what is the status today. If Norway is to achieve its target within offshore wind production (and other climate and environmental targets in general) there needs to be a political willingness to do so. It is the opinion of the author that this will not present itself without a drive from the public, and this will not materialise without fact-based, objective, transparent and sufficient debate in society.

- There is a large degree of consolidation in the energy sector alongside a substantial development in the frame conditions. The four D's (decarbonisation, digitalisation, decentralisation and democratisation) (Soutar, 2021) are driving deep and profound changes in the whole sector. This study is therefore (as all such studies) of temporary validity. Repeating the study in the future may reveal a different stakeholder landscape, different drivers and barriers. Although the author does not believe that there will be completely new drivers outside the ones identified, there may be larger changes in the barriers if some of the identified ones are overcome. Also, the ongoing consolidation of actors and the debate around new market structures may introduce new types of stakeholders (possibly aggregators (Filipovic et al., 2019)) that may become important in a future landscape.
- Due to the scope of this thesis being directed towards organisational theory and applications of this, technical aspects have not been discussed in detail. There is however a potential scope in studying how to facilitate the development of the needed technical solutions for efficiently developing such a large-scale wind farm deployments. This is in a wider context identified also by the European Commission (Mazzucato, 2022), and is being prioritized in their research programs. The types of organisations needed, how they are to interact and which incentives are efficient could be possible research questions for such studies.

## 9 Appendix A - Interview summaries

This appendix presents a summary of the interviews conducted. The presentation is based on the questions set fourth in the methodology chapter. The summary is presented anonymously and without reference to the organization the interviewee represents. Furthermore, the interviews were conducted in Norwegian in order to make the discussion flow easier and for the interviewees to have as low a threshold as possible for expressing themselves clearly. The vast majority were native Norwegian speakers. As a consequence the interviews has been translated to English for the purpose of being represented in these summaries. It is important to note that the notes which the analysis and discussion is based upon is in Norwegian and that this is the native language of the author. The loss in translation is therefore mainly in the author's ability to objectively convey to the reader what the interviewees said in their interviews in the below summaries, and not in the foundation for the analysis.

Even though the content has been translated by the author from Norwegian to English, this does not mean that the author supports or agrees with all the statements given below. They are noted down as presented by the interviewees as accurately as the author has found possible, and thus represents the opinion of the interviewees.

## **9.1 Interview no. 1**

### **Description of roles and objectives for the stakeholder**

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

The main role is to represent the member's interests towards the government, specially in relations to the formulation of laws and regulations. This is particularly important when new laws and regulations in emerging fields are being formulated. It is important that socioeconomic principles are adhered to, and that there is predictability for the members in their business fields. Part of this includes the access for the members to markets outside the present Norwegian market.

#### **IQ #1B What is the objective of your organisation in this future development?**

This is a member organization covering the whole value chain for electric energy from producer, through distribution to delivery to end-consumer. The organization is a member of NHO. We collaborate closely with the other member organizations in NHO, in particular with organizations closely related to the energy sector. The overall objective is to serve the interests of our members and their business interests.

#### **IQ #1C Who determines the objectives of your organisation?**

The members determines the objectives for the organization through the general assembly and the election of the board.

### **Drivers and barriers for large scale offshore wind development**

#### **IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

The major driver is the profitability of the operation, either by itself or through some kind of governmental subsidy. A possible form of subsidy would be a contract

for difference (CfD) scheme that has been utilized in a number of wind farm developments in the past. This would lower the risk involved in financing the wind farm developments and would thus lower the interest rate for the needed financing. Therefore this type of subsidies could make the wind farms more profitable even if they are not directly utilized during operations.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

There is good alignment between the objectives of our organization and the main drivers for large scale offshore wind farm developments. The main alignment point is the sound socioeconomic value creation that would be beneficial for the whole nation.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

The main barriers as seen by our organization is a combination of market and processes phenomena. The licensing process is without proper regulations. If the offshore process is to resemble the one we have seen onshore, this will be a very lengthy process giving grounds for considerable uncertainty. The fact that the length of the process in and off itself is unknown is in and of itself a source of uncertainty. The uncertainty connected to the licensing process may also give rise to long delivery times as no contracts can be awarded before this is settled. It is expected that the offshore market will increasingly be a sellers market as a large number of offshore wind farms is to be built in a short time. Such a rapid build-out has been undertaken before in the oil and gas industry, and can be handled through proper processes. If Norway has less predictability than competing countries this will constitute a drawback.

Furthermore, the solutions for bringing all this electric energy to shore and to the demand centers is a challenge. This concerns both technical and environmental aspects, specially through the wetlands at the shores of northern Europe. There will be a need for coordinated corridors as opposed to a large number of single

cables. The countries around the North Sea need to coordinate on this to make a realization of the offshore energy generation potential possible.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

If each cable is 1.4 MW then this will require  $\sim 100$  cables. This is not feasible environmentally nor in the perspective of co-existence between the energy sector and other interests in the area. There is also a conflict of interest between the wind farm developments and fishing interests, both large scale and small scale.

In this perspective it could be difficult to have the quoted capacities built within the time frames listed. However, having licences awarded is much easier than having it built, and this target should be obtainable. If the awarding process has not met a target of 30 GW awarded on the NCS by 2040, there has been a poor handling of this process.

It is important that the cabling onshore in Europe is taken seriously, and more effort should be dedicated to this task.

### **Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

There is a large number of cooperating stakeholders. We have communications with service vendors, banks and lawyers as well as wind farm developers. There is a consolidation of actors in the field presently, and larger organizations/consortia may appear.

**IQ #3B Are there stakeholders opposing your achievement of your objectives**

There are very few stakeholders opposing this development. Some *traditional stakeholders* such as Motvind is against, but they are opposed to all wind energy devel-

opments. The fishing industry is opposed to major build out until there are proper regulations in place to regulate co-existence.

Opposition to developments does often not manifest itself until building starts.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

Direct quote: *The price in the south of Norway needs to drop below 3 NOK/kWh before any hybrids can be built.* This is an example of the effect of public opinion,, and the members of our organisation is affected by this. There is now a large focus on flexible solutions, and this shapes what the organization is working on. The shift in public opinion causes the organization to adapt its timing for its activities.

## 9.2 Interview no. 2

### Description of roles and objectives for the stakeholder

#### IQ #1A What is the overall role of your organisation in the offshore wind power sector?

The main role is to represent the interests of our members interests both as a interest organisation and a scientific institution. The organization acts both as a employer organization and an employee organization simultaneously. This causes internal tension to some extent, however on the topic of offshore wind farm development there is a large degree of consensus in the organization. The organisation represents actors that have a vested interest in the utilization of the resources in some of the ocean areas that have been identified as suitable for wind farm developments. However, these actors are not land owners and thus needs to share the resources in these areas.

#### IQ #1B What is the objective of your organisation in this future development?

This organisation promotes that fishing interests of Norwegian fishers, both large and small. This includes influencing processes that affect the regulation of the industry, the utilization of the ocean resources and other aspects relevant for Norwegian fisheries.

#### IQ #1C Who determines the objectives of your organisation?

The organization is a confederation of the *fylkeslag* (county organizations) that governs the organization. Formally it is the general assembly (*landsmøte*) that sets the objective of the organization.

### Drivers and barriers for large scale offshore wind development

#### IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?



The main driver for the offshore wind farm developments are profit for the developers, and this is thinly veiled in a *greenwash* to make this more appealing to the public.

The reason for building large offshore wind farms is often said to be the environmental benefits from such developments. However, there are no studies that look at the totality of these developments, and takes into account the full life cycle of the wind farms and all that their installation and operation entails.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

Both the process of building offshore wind farms and their business model is promoting the placement of these farms in the southern part of the North Sea where there are large fishing interests. This leads to conflicts of interest regarding utilization of the ocean space. This can to a large extent be solved through dialogue, but there is historical precedence of poor communication and little willingness to listen from the developers side.

The fishing community will most likely accept new areas for wind farm developments, but there needs to be a more careful consideration of the implications on the marine ecosystem. There is an inherent conflict in that the shallow parts of the North Sea (*fiskebankene*) both have large fishing resources and are often well suited for wind farms. It is also important that the (hybrid) cables does not interfere with the fisheries.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

The organization has until February 2022 had a positive impression of the offshore wind farm development. However, this has recently changed. Hywind Tampen has had an adverse impact on the outlook of mutual beneficial co-existence. The lack of communication and willingness to treat co-existence issues fairly has diminished the faith in such processes, and has generated a large amount of scepticism among the fishing community.

In summary the conflicts regarding the usage of the ocean spaces is the main barrier. There is a large difference between the different ocean spaces. Deep waters in the Norwegian Sea is much less prone to this type of conflict, and there are vast areas that can be utilized for offshore wind farms. This may however not be suitable locations for such installations.

In addition to the ocean space conflict there is the question of marine noise and other factors scaring the fish away. This topic is poorly studied, and there is a need for further detailed studies on different types of fish. A detailed mapping of the sea bed needs to be done to properly assess the environmental impact of developments both for floating and sea-bed installations.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

It is little likelihood for these development targets to be met. There is controversy regarding the area required to meet these targets. Some reports quote a potential for 5-7 MW/km<sup>2</sup> of installed effect. However, some studies report only 1-2 MW/km<sup>2</sup> is obtainable in these waters. The higher estimates indicates that about 3600 km<sup>2</sup> will be sufficient, but if 5-6 times this area is needed this will be a problem.

### **Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We see no other stakeholders other than fishing organizations as core cooperating partners. We strive to have a good dialogue with offshore wind farm developers, with focus on the utilization of the ocean space and co-existence issues.

**IQ #3B Are there stakeholders opposing your achievement of your objectives**

No organization is identified as against sustainable fishing in and of itself, but the activity is threatened by the above mentioned conflicts. The organization is however

being heard more now than before.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

The public opinion is somewhat important for the choices of the organisation. The fisheries cannot be seen as opposing all offshore developments, and thus has to accept some co-existence.

### 9.3 Interview no. 3

Comment from the author: The interview questions were sent to the interviewee before the actual interview. The interviewee commented at the start of the interview that the questions were posed very much from the wind farm developers point of view, but that the persons best efforts should be made in answering them. The author found that the interview was conducted in a constructive and engaged manner from both sides despite these comments on the questions.

#### **Description of roles and objectives for the stakeholder**

##### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

The organization works on a broad range of issues including fish-farming, waste from the mining industry, plastic in nature and quicksilver left over from the Second World War. At its core this is an environmental organisation founded on deep ecological principles that promotes the view that everything in nature has its own value. The role of the organization with respect to offshore wind farms includes education and awareness building towards the public and politicians. The organization cannot only criticise initiatives, but also needs to point out good solutions.

##### **IQ #1B What is the objective of your organisation in this future development?**

The overall objective of the organization is to promote and secure the protection of the environment. In part this is done through holistic political solutions for issues such as environmental toxins in food, land usage and the protection of farm land, species diversity and the wider usage of ground cables in the transmission system.

##### **IQ #1C Who determines the objectives of your organisation?**

This is a very dynamic organization where the focus shifts rapidly from issue to issue as the situation demands. The organisation is run with very little bureaucracy, and with a large degree of internal consensus and individual initiative. Communication

with management is more for clarification and coordination. The members are to a large degree autonomous, enabling them to react quickly to changing circumstances.

## **Drivers and barriers for large scale offshore wind development**

### **IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

The major driver is lies and deception (in Norwegian *løgn og bedrag*, direct quote) combined with a "subsidy party". There is a large amount of money being spent on the offshore developers. As an example Erna Solberg spent 3 billion NOK on "cleaner ocean" (Norwegian *renere hav*), Hywind Tampen got 2,3 -4,5 billion NOK. This will not result in a cleaner ocean.

Many companies sell the projects on to foreign entities. 70 % of onshore wind is owned by tax havens (Norwegian: *skatteparadis*) and the development is economically motivated with little environmental perspective.

### **IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

There is a poor alignment. There are no environmental benefits from offshore wind energy generation, it is all based on lies and propaganda. The main drivers is the profits to be had, specially from the subsidies. Direct quote: *There is nothing that can change our view on this, this is totally wrong!*

Furthermore, the offshore wind development displaces other good alternatives such as geothermal energy. In this field there has been major developments lately (cost reduction, new technology and system integration) that has been suppressed. It is likely that the projects within alternative technologies are being conducted in an expensive manner to give the impression that these are not cost effective and feasible.

### **IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

There are no credible LCA (Life Cycle Assessment) studies put forward for this that sufficiently covers a holistic approach. Such an assessment needs to cover freight and transport, the infrastructure needed and the end-of-lifetime recycling of all parts. In addition it needs to take into account land usage (onshore and offshore) and terrain type. The developers does not produce analysis that are founded in reality, this hinders a sensible debate. Major emissions will take place before production of energy even starts. All that is presented is lies and deception (Norwegian *løgn og bedrag*, direct quote). The terms used is like they have been picked out of George Orwell's *Newspeak*, totally changed meaning and very confusing.

In order to move forward the first thing that needs to be done is a transparent, holistic and realistic LCA studies presented by the offshore wind developers. As it stands today there is a lot of secrecy surrounding these analysis, this removes the credibility.

Very little of the development/turnover will originate from Norway, and the value creation will not take place in Norway. This is contrary to the propaganda put forward by the wind farm developers.

The wind energy is also intermittent, and will need massive amounts of balancing power. This is not the case with for example geothermal energy that can be regulated. In addition, the supply industry will struggle to supply the needed infrastructure. The German *Energiwende* has gone in the wrong direction and given large system instabilities. There is a lot of simultaneous wind, and the combined capacity will exceed the handling capacity of the system. The proposed area Sørilige Nordsjø II is in the same area, and will further increase these troubles. We cannot rely on this strategy, it is founded on quick money directly in the pocket of the developers with no socioeconomic moral.

This must be regarded holistically, including all the major environmental aspects such as micro-plastic from the turbines. Currently the numbers from NVE and Miljøverndirektoratet (the Norwegian Environmental Agency) comes from the industry. These numbers are lies and originates from other geographical areas that makes them non-realistic for use in a Norwegian setting. Deployments further north

will cause more wear and tear, larger need for support operations (transport etc.) and higher erosion. There is no application of the principle of applying caution (Norwegian *føre var prinsippet*) and not enough research before the deployment of offshore wind farms. This applies for example to the issue of noise pollution that is poorly understood.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

Given enough money and resources everything can be built, and this may be carried out. It may be realised due to the desire for profit.

### **Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

The organization interacts with many actors in the offshore wind industry, and particularly targets politicians and the public in order to influence and educate.

**IQ #3B Are there stakeholders opposing your achievement of your objectives**

As described in the above sections (specially regarding barriers) there are severe opposition to the holistic environmental protection objective that our organization promotes.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

The organisation is impacted by the public opinion, and due to the autonomous nature of the organization's members this is a very rapid process.

## **9.4 Interview no. 4**

### **Description of roles and objectives for the stakeholder**

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

This is a DSO (Distribution Service Operator) onshore, and as such we cannot choose what the net is to be utilized for due to the monopoly situation and associated regulatory framework. Thus, we have limited role in the offshore setting. The large volumes of electric energy is expected to be tied in to the TSO's (Transmission Service Operator) transmission net, and only smaller developments into the DOS's net. No particular procedures for connection of offshore energy, treated as any other producer with some minor technical details.

#### **IQ #1B What is the objective of your organisation in this future development?**

The objective of the organisation is to build and operate electric grid infrastructure on land in an efficient and reliable manner. We will not own sub-sea infrastructure. This field is very regulated through laws and regulations.

#### **IQ #1C Who determines the objectives of your organisation?**

This is highly regulated as mentioned above. The situation of monopoly puts strong limitations on the operations. There is a requirement of offering connection on a non-discriminatory and objective basis, limited possibility for changing tariffs and strong governmental oversight.

### **Drivers and barriers for large scale offshore wind development**

#### **IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

The major driver is economic profit from the perspective of the offshore wind farm developers. There is also a political driver, but this also to a large degree founded in



the desire of profits. This is combined with the desire to reduce the CO<sub>2</sub>-emissions from the energy sector, and that this is seen as part of the solution for the climate crisis.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

The organization is neutral with respect to electric energy source, as all DSOs are required to be. However, the challenges with integrating large amounts of intermittent power production is central for any DSO.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

From a DSO perspective wind power is problematic since it is intermittent in nature. The technological and economical solutions for including this into the power system needs to be in place. The wind developments are built for profit. Laws and regulations in this field must be put in place before large scale developments can be undertaken. There is the possibility that the offshore developers need to pay for grid access onshore if the offshore developments require extensive onshore investments.

There has over the last few years formed a large opposition to land based wind energy, this may be seen offshore as well once the offshore wind energy developments starts being built. The usage of land is a contested issue. The public may not care so much about the areal usage offshore, but they care about the onshore facilities that receives the power. The least amount of opposition may be experienced if the power is tied into prices areas with a power deficit. Connecting the offshore power to price areas with a power surplus will require larger infrastructure investments and more allocation of land to these. It would be more beneficial for both producers and consumers to connect the offshore developments to deficit areas.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

The intermittency of the source is the main challenge for the realisation of these targets. The market is already saturated with wind power as it is, and there are large correlations in time regarding production from the suggested areas. There should be more diversification in the energy supply, specially as non-intermittent power sources are being phased out. Nuclear energy is fossil free and non-intermittent, and is well suited as a replacement.

### **Cooperating and competing stakeholders**

#### **IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

Strong cooperation with other DSOs and the TSOs. Our cooperation is as described above well regulated. NVE and OED sets the rules, and there needs to be interaction with them.

#### **IQ #3B Are there stakeholders opposing your achievement of your objectives**

There are selected organizations that are opposed to the development, and in particular to the construction of infrastructures on land. This includes tourist organisations and environmental organisations. Some are against all developments, and some only wants adjustments. There is an aspect of "not in my backyard" mentality when it comes to power infrastructure.

#### **IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

This is quite important for the development of offshore wind farms. It is an established fact that the purpose of new infrastructure (such as cables) impacts the public's perception of it. Gaining public support for initiatives is important, they need to see that the local implications benefits them and not only for example goes to export. The public was originally quite positive to onshore wind energy, but opinion changed very quickly. This may happen to offshore wind as well.

The DSOs are to a large extent shielded from this, but need to interact with the local communities such as the municipalities.

## 9.5 Interview no. 5

### Description of roles and objectives for the stakeholder

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

The overall role of the organisation is to represent the Norwegian consumers through guidance/education of the public and influencing relevant political processes.

#### **IQ #1B What is the objective of your organisation in this future development?**

The objective of the organization is to support the Norwegian consumers and influence society in a more consumer friendly direction.

#### **IQ #1C Who determines the objectives of your organisation?**

The organization is controlled by a governmental department and heavily influenced by feedback from the consumers. The choices and objectives of the organization is to favour the consumers. Feedback is gathered from the consumers directly and indirectly. Yearly we receive more than 50000 direct feedbacks from Norwegian consumers in the form of telephone calls.

### Drivers and barriers for large scale offshore wind development

#### **IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

Norway stands on the brink of a power deficit, this will take place in a few years if the current trend is continued. This is under-communicated, and the nation needs more power generation to be self sufficient, regain a low power price and a robust security of supply. Our organization does not have opinions regarding which generation technology that is to provide this additional power. However, we do support the Green Shift in the energy sector since the consumers are in favour of this. offshore wind energy is renewable, and this is a fact in favour of this technology.

It is an observed effect of the recent instabilities that the energy crisis gives greater insight into energy markets and the power system for the public.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

This is too far back in the value chain for our organization to have an explicit opinion about this alignment. We do not want to have an opinion on such a peripheral topic.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

The cost of offshore wind energy is for the moment unclear, and the implications for the consumers is therefore also unclear. There is a need for more power generation, but there is strong political opposition towards several types of generation. There are several options that can jointly help fill the needed power generation, among these upgrading the current hydro power system. There are several organizations that give differing estimates for the power need, but most agree that the need will come.

The consumers may come to demand a redesign of the power markets (potentially the energy markets) based on the present crisis. This could impact an offshore development.

There is presently a large uncertainty connected with the impact from an introduction of such large amounts of intermittent power into the Norwegian power system, and in particular on the power price and its variability. Therefore the impact on the consumers is unknown. It may be that spot-price based contracts will to a larger extent give way to fixed-price contracts for common consumers. In general it is an advantage that there is a large number of choices for the consumers.

The introduction of flexible demand such as enabled by smart-house technology is slow, and leads to little consumer flexibility. This may slow down the introduction of intermittent power generation.

There is a need to shield the weaker consumers. One way of doing this would be

by identifying economically sound energy conservation measures and pair this with efficient ENOVA support.

There are no strong positions formed by our organization, and we do not have a formulated opinion on this.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

Our organization follows the debate, but does not have any opinion on this likelihood.

### **Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We cooperated closely with other interest organizations, specially those representing consumer segments such as house owners, cabin owners, transport organizations and employee organizations.

**IQ #3B Are there stakeholders opposing your achievement of your objectives**

We find that there are few stakeholders that are directly opposed to our objective. However, we observe stakeholders that disagree or act counter to what we find to be in the consumers best interest. Examples of this is power producers charging a premium for their power, power agents having a large commission for the sale of power, governments not giving enough emphasis on non-professional consumers in a liberated market and the introduction of more complex tariffs that is hard to comprehend for the average consumer. We observe that it is becoming more complicated to be a consumer. Our task is to guide, inform and scrutinize. Few consumers devote large portions of their life to the purchase of power, and few have detailed knowledge of the power system.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

The public opinion has a large degree of impact on our choices and actions. We are consumer oriented. Although there may be strong but brief opinion-shifts, we need to balance this towards a change in a beneficial direction for the society at large. If goods and services are too expensive this needs to be highlighted. There should be a sensible price for all goods and services, with an acceptable profit margin in all parts of the value chain. This is to the benefit of both producers and consumers. It is important that distribution effects and vulnerability in the population towards price shifts is taken into account in the market design. We do generally not have an official opinion on specific subsidies, but do when it is in the interest of the wider public.

## 9.6 Interview no. 6

### Description of roles and objectives for the stakeholder

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

We are a transmission service operator (TSO) and are therefor responsible for facilitating an efficient, robust and economic development of the transmission grid. We are a governmentally controlled and extensively regulated organization. This is done in order to treat all actors objectively and equally with respect to access to the transmission grid.

#### **IQ #1B What is the objective of your organisation in this future development?**

Our objective is to build and operate the transmission grid in order to facilitate for the introduction of stable energy sources, robust energy supply and equal market access for all to the grid.

#### **IQ #1C Who determines the objectives of your organisation?**

We are owned and regulated by a governmental department. Although we are an independent organisation, our objectives are set by the department.

### Drivers and barriers for large scale offshore wind development

#### **IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

The main driver for this development are political ambitions regarding a green energy transition combined with value creation objectives both by the government and the developers. The politicians are focusing mainly on the green energy transition, and the developers are more focused on the potential profit from these developments.

The war in Ukraine has made the situation more severe, the security of supply has been negatively impacted and this may affect the demand for profitability in the



power generation. There are signs that it is more important to have a strong security of supply than secure profit margins.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

There is a very good alignment, this is one of the underlying reasons for the existence of a TSO.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

There are lengthy and complicated decisions processes connected with this development. There are strong requirements for environmental surveys, and a large degree of *not in my backyard* mentality hindering the development. There needs to be made changes in the process. In addition, there needs to be a clarification regarding what this extra power is to be used for. The end-usage of the power has a large impact on the design of the system. Unclear end usage (directly in industry, hydrogen production, residential heating) gives uncertainty for the developers. There is a need to build this system step-by-step under a large degree of uncertainty. There is an process ongoing in which several stakeholders needs to recognize this fact.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

There is a big difference between awarding a license and having it built and producing. The awarding of licenses are considerably easier than building them. These targets may be achieved, but it will be a stretch target to have all this built within 2050. The realization of these targets will require a shift in the methodology for developing large wind farms and systems of such. There is many good experiences concerning the development of single wind farms and connected radials. However, these scales require a different approach. Again, this is to some extent determined by the intended usage of the power, hereunder domestic usage or export. This puts different requirements on the transmission grid.

## Cooperating and competing stakeholders

### **IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We cooperate extensively with the responsible department, local government (municipalities), wind farm developers, local interest organisations (such as walking communities) and TSOs directly and through ENTSO-e. There is some occurrences of "not in my backyard" thinking/culture that makes on land developments more challenging and time consuming.

### **IQ #3B Are there stakeholders opposing your achievement of your objectives**

There are few organizations that directly opposes our objectives and activities. More often there are cases where actors feel that projects should be carried out in a different manner, at other places or take some special considerations into view. Electricity is perceived to be expensive, and the threat of rationing is looming in the mind of the public.

### **IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

We are to a large degree impacted by the public opinion, and have a extensive dialogue with public entities. This is particularly true when there are overhead lines being put into place. Direct quote: *If we are to meet the targets set forth for 2040/2050, we need to do this in cooperation and dialogue with the society at large.*

## 9.7 Interview no. 7

### Description of roles and objectives for the stakeholder

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

The overall role of the organization is to be responsible for the planning and operation of the transmission system of the country. This covers both the onshore and offshore transmission grids. It is important to remember that this is one combined system and not two different grids.

#### **IQ #1B What is the objective of your organisation in this future development?**

The objective is a rational development of the overall power system, with a strong focus on holistic assessments. A secure and robust operation of the transmission grid both onshore and offshore is in focus. This includes the inclusion of offshore wind power into the overall system.

#### **IQ #1C Who determines the objectives of your organisation?**

The organisation is organised as an independent entity under the responsible governmental department. The objectives and choices of the organisation is to be founded on knowledge based and scientific principles, and formed with a sufficient degree of separation from the department. Even as a fully owned governmental entity. There are checks and balances put in place overseen by other independent entities to make sure the organisation adheres to current laws and regulations, and is operated in a sound and socioeconomic profitable manner.

### Drivers and barriers for large scale offshore wind development

#### **IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

There are several drivers for the large scale development of offshore wind farms in Norwegian waters. However, three drives stands out as the most important. Firstly, Norway needs more production of electric energy in order to carry out the electrification and industry development we as a society desires to do. Secondly, Norway needs this electricity in order to reach a net zero-emission society as we have pledged. Without increased production Norway will become a net importer of electric energy in about 5 years given projections for consumption and production as they stand now. Lastly, Norway needs to develop new industrial sectors in order to keep up the value creation and provide jobs after the decline in the oil and gas sector will make itself present. We have a strong offshore competence, and can build an offshore wind farm supply sector both for internal use and for export.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

There is a good alignment between the main drivers for the development of offshore wind energy and our objectives. The new strategy for offshore developments is well understood and well rooted in the organisation. This builds on a deep drive towards developing a net-zero emission society, with industrialisation and value creating as a good runner up.

We as an organization facilitates for the development of new power generation and new industry. This new industry needs grid and new power generation. The volume of applications for connection to the grid of new loads requires this development.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

The main barrier for the realisation of large scale offshore wind energy generation is long licensing processes. This applies both to the generation and grid aspects of the development. These processes needs to be shortened, and have a clearer distribution of responsibilities. We are currently at risk of "missing the train" on this development.

Norway is a large country with a long coast and vast oceans that are deep. There is a

need for technical developments in order to make floating wind generation profitable. This technology may need subsidies in an initial phase to become developed and profitable.

It is important that the exploitation of offshore resources is done in a sustainable manner.

In conclusion: The main barriers are 1) Long licensing processes, 2) Technological development for floating offshore wind and 3) Distribution of roles and responsibilities.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

The development of 150 GW in the DE/DK/NL/BE region seems plausible, they need to build this in order to reach their emission reduction targets. 30 GW for Norway will require political will and an ability to take action. This could be feasible, but will require that changing governments does not alter in their resolve to see this through. There is a need for a steady course to make this happen.

At the same time the flexible hydro power will become more valuable and may be required to deliver more instantaneous power rather than long term energy. Simultaneously, the consumer side of the balance will need to adapt, and be more flexible. Power needs to be to a greater degree consumed when it is available.

### **Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We cooperated with a broad range of other organisations and entities. The department has formed a cooperation forum that is quite broad in its composition, and we are an active member. We also cooperate directly with relevant departments, regulators, producers (and their interest organisation), environmental organizations,

various specialty interest organisations (such as those representing the fisheries) and the labour organisations.

If large scale offshore wind developments are to be a reality there needs to be a broad cooperation.

**IQ #3B Are there stakeholders opposing your achievement of your objectives**

The cooperation forum has as noted a broad composition, and includes also some stakeholders sceptic to the development of large scale offshore wind power generation. Some political parties has voiced arguments against such a development. However, there are no major actors fully opposing this development. There are actors such as "Motvind" that have voiced a strong opposition. However, the largest threat towards the development of large scale offshore wind power is the lack of decision making by the responsible parties.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

We are to a small degree affected by public opinion. Our organization is more directed towards knowledge based studies and scientific principles. Our communication may be more shaped by public opinion as take part in the public debate. This does to a very little degree affect our decisions. They are to be holistic and based on long term assessments.

## 9.8 Interview no. 8

### Description of roles and objectives for the stakeholder

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

We are a two year old company that has as a mission to build and operate offshore wind farms. We foresee an active involvement in the entire development process and as an active and long term owner and operator of offshore wind farms in multiple countries. We are owned by a consortium consisting of local power generation companies, foreign investors and companies with offshore engineering experience.

#### **IQ #1B What is the objective of your organisation in this future development?**

This is closely tied to our role, and it is at present to develop and build offshore wind farms.

#### **IQ #1C Who determines the objectives of your organisation?**

As a company fully owned by investors, our objectives are set by the owners. As noted this is a joint-venture of several companies, and the share-holder majority decides.

### Drivers and barriers for large scale offshore wind development

#### **IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

For the employees in our organisation the drives are to a large extent personal. The current power prices are not going away in the short term, but is rather a manifestation of a need for more power generation. There is a large need for new green energy. The days of 20-30 øre/kWh is history. The overall driver is to get more green energy into the power system.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

There is a very good alignment between our objectives and the drivers for large scale offshore wind farms. This is the perception of all the employees in our organisation. We are as noted a young organisation, and the employees has brought these objectives with them into the company. We all desire to take part in the green shift currently taking place in the energy sector and in society at large.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

The main barrier is the behaviour of the responsible governmental entities and the licensing processes. We are happy about the direction and the ambition stated, but the licenses are taking a very long time to be awarded. The capacity for processing at the central governmental and regulatory bodies is not sufficient.

There is also uncertainties surrounding the awarding process and the rules for the licensing. There is a be a competition, but the rules and criteria for wining this are not clear. There are presently 12-13 consortia positioning themselves for this competition, and it is expected that this will be a close race. The rules needs to be clarified.

Utsira Nord is expected to be built using floating wind farms and an auction mechanism for awarding the license. It is unclear what types of subsidies will be offered. We do not expect that the first few floating projects will be possible to build based on spot price alone.

Sørlige Nordsjø II is expected to be fixed structures and this should be possible to build without subsidies. There is however the issue of HVDC connection and the rules and regulations connected to this.

It is unclear where the interface with the TSO is to be. In Germany the TSO owns the HVDC links, but in England the developers owns this themselves.

**IQ #2D How likely do you think the realisation of the development plans**



**(NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built)  
are**

We can wait with the masked grid and hybrid cables, but we need to start the building of the offshore wind farms. Potentially we can delay the hybrid discussion until the third round of licenses at the Sørlige Nordsjø field.

Having said this, it is quite unlikely that we'll reach these targets within the quoted time frame. They do however need to be built in order to reach a net zero-emission society.

Balancing the non-regulated wind energy is a challenge. This is OK for Norway, but more difficult for the rest of Europe. Local producers along the coast can balance some, but there needs to be performed studies as to the overall balancing needs and balancing potential from Norwegian hydro power.

### **Cooperating and competing stakeholders**

#### **IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

One of our major cooperating partners is our international investor that has prior experience with developing and building offshore wind farms.

We extensively utilize local entrepreneurs and service providers, and this is important for local support. A good dialogue with the fishing industry and coordination with local power producers is important.

It is unclear whether such local interaction will be taken into account in the licensing process, but this may be a competitive advantage.

On land the wind farm industry has failed in anchoring their development in the local community. This has had severe adverse effects. With our approach we hope to avoid this potential pitfall.

#### **IQ #3B Are there stakeholders opposing your achievement of your objectives**

There are few organisations or stakeholders fully against this development. However, those that are against them are very loud and outspoken. We expect less conflicts and less opposition for offshore wind farms than for onshore ones partially due to the remoteness from populated areas.

Generally we find that stakeholders and entities are in favour, but they want something in return. There is a need for making this link clearer.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

The public opinion is important. Fisheries, local environment and local jobs are important. A strong focus on local value creation and avoidance of conflicts with the local interests both onshore and offshore.

## 9.9 Interview no. 9

### Description of roles and objectives for the stakeholder

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

Our role is mainly to be a wind farm developer. We aim at planning, building and operating offshore wind farms in Norway and globally over a long time period. This is a natural development of our current oil and gas activity that we are seeking to diversify.

#### **IQ #1B What is the objective of your organisation in this future development?**

Our target is to have equity of 12-16 GW offshore wind power operational within 2030, and become a major actor within the wind farm sector. That means being among the ~ 10 largest wind farm operators globally. This is needed to replace the current value generation from the oil and gas activities we currently operate.

#### **IQ #1C Who determines the objectives of your organisation?**

We are a publicly traded limited liability company. The overall objectives are set by the general assembly and implemented by the board and the group management. Objectives and ambitions related to the planned renewable activities are of such a magnitude that they are approved by the board, and have a dedicated member in the group management.

### Drivers and barriers for large scale offshore wind development

#### **IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

The largest driver is the energy situation and the lack of other energy sources. There are large challenges and controversies related to the utilization of land areas for

energy generation. At the same time there is a dire need to increase the generation of renewable energy in order to meet the climate targets.

We believe that there are large benefits from large scale operations as this offers economies of scale. This is part of our development strategy.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

There is a very good alignment between our objectives and the drivers we have identified for the large scale development of offshore wind energy generation. We have our own ambitions with regards to developing renewable energy production and this is ingrained in our staff (direct quote: "Sitter i ryggmargen"). This supports our objectives.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

There are some barriers identified. Among them are area conflicts with fisheries and other commercial interests in the ocean space. There are also challenges connected with the profitability of offshore wind energy generation and the uncertainty related to the cost of construction and operation in novel waters.

We also observe and expect challenges in the supply chain for the equipment needed for these developments. There will most likely be a significant increase in the demand for offshore wind farm equipment, and it is unclear if the supply industry can deliver on the required scale and time line. Further down the supply chain there may be challenges in obtaining the required materials (metals, minerals,...) for this development. This access is threaten by growing geopolitical conflicts and scarcities may arise that are difficult to handle.

It is also a challenge that Norway has a limited workforce. Even though the workforce in Norway is very skilled and productive, there may not be sufficient capacity to fully exploit our potential in this area if it is not prioritized. The public opinion may shift quickly (as it did for onshore wind farms), and this may hinder or delay the licensing process and the availability of labour.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

We see the realization of these targets as likely. The drivers for obtaining them are so strong that they make this plausible. Europe (and Norway) has both a strong ambition to move away from fossil fuels and a very strong driver for securing its own energy supply. Both these targets will be met partially by a large scale development of offshore wind energy generation.

### **Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We cooperated with a broad spectrum of suppliers, authorities, regulators, TSOs, DSOs and interest organisations. We are in the process of securing contracts with suppliers of equipment for our development plans, and we are negotiating with potential end-users of the energy for long term contracts. The condition for the licensing process is not yet determined, there may implemented CfD (Contract for Difference) style subsidies.

**IQ #3B Are there stakeholders opposing your achievement of your objectives**

Fishing interests and wind farm developers may have a potential conflict related to the usage of the ocean space. Scale will be a determining factor here. The situation looks promising at the moment, but we observe that the dialogue is becoming more strained. It is important to start discussions at an early stage.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

The public opinion matters to some degree, and is being listened to. However, we need to stand firm in our decisions. On the other hand our shareholders is often affected by public opinion, and this affects us.

We take an active part in the public dialogue, and promote our view of the situation. There are concrete projects that has been developed and build in order to meet changes in public opinion.

## **9.10 Interview no. 10**

### **Description of roles and objectives for the stakeholder**

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

Our roots originates from power production, originally hydro power. We have diversified and established a consortium for the development of wind power. We see that it is hard to develop more hydro power. In order to extend our production, wind power developments are a natural next step. We seek to develop and operate wind farms both onshore and offshore. As the onshore development of wind power in Norway has halted the last few years, further developments must happen offshore. In order to defend our position as a relevant energy producer we need to maintain our market share. A inclusion of offshore wind energy generation in our portfolio also helps protect the rest of our assets, in particular at the points along the coast where the offshore power is to be brought onshore. It is also our stated objective to support the development of renewable energy sources in Norway and Europe.

#### **IQ #1B What is the objective of your organisation in this future development?**

Our objective is to be a relevant supplier of renewable power and meet future power demands. We have both an objective of being profitable and acting socially responsible. This is partly due to our substantial degree of public ownership. We are also committed to look at negative emission technologies (for example various forms of carbon capture technologies) with the aim of being climate positive as a company within 2035.

#### **IQ #1C Who determines the objectives of your organisation?**

We have a strategy department that develops plans for our corporate strategy. The strategy is then approved by the board and the group management. The owners gives guidelines and ultimately stands behind the objectives of the organisation.

Only the overall strategy is approved by the board. This acts as a guidance for all choices in the organization and is well anchored among the employees.

## **Drivers and barriers for large scale offshore wind development**

### **IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

The main driver for this development is the green transformation of society at large and the energy sector in particular. There is a need for the introduction of emission free energy sources, and a need in general for more energy generation.

Energy security is also a driver for this development. This has been made more urgent with the current war in Ukraine and the soaring cost of energy.

In addition to the energy generated from the offshore wind farms, this will also provide jobs during construction and operation, and will potentially form a new export industry. We as a company desire to be a constructive force within the Norwegian society, and support widespread value creation in the nation. These are politically motivated objectives. Profit alone is not the main driver.

### **IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

These drivers fit very well with the objectives of our organization. We support a balance between sustainability, climate action and preservation of nature. All these perspectives need to be taken into account. We as an organization are affected by events in the world, such as the war in Ukraine and the energy security situation. Our employees are also affected by this situation, and we find that they are motivated by these drivers and seek to solve the underlying issues.

### **IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

There is a need for a more rapid change and faster development in order to make



these developments come through. We need efficient processes that also maintains the sustainability issues.

There are issues with the capacity of the supply industry in meeting the demand within this area. This poses a risk for the developments. These challenges are global in nature.

The developments are associated with a considerable level of risk that the board needs to take into account before investment decisions are made. It is hard to get a sufficient overview of the various risks involved. These are new areas for development, and the risk associated with the selling price of electricity may not be the largest risk to be handled.

There is a need for a onshore grid that can absorb the large quantities for power that will be generated. This is intermittent power and there are large challenges in handling and balancing these quantities. Again, this is an international challenge.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

We are very doubtful with regards to the realism in these plans. The supply chain issues and availability of raw materials alone may hinder the realisation of these plans. However, we choose to be optimistic and work towards the developments needed to meet these ambitions.

It is much easier to award the licenses than to having the wind farms built and operational. As such, having awarded 30 GW in Norway by 2040 should be possible. This will take political willpower and courage to do. There is a widespread right of appeal in Norway, and this slows down very many processes. Everybody have the right to appeal, and there are many actors. However, the war in Ukraine and the energy situation may dampen the number of appeals and make this happen.

**Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We cooperate with many parties in our development. Among these are governmental institutions, regulators, TSOs/DSOs, interest organisations (such as fishing organisations), shipping organisations, the coast authorities, research organisations, suppliers and ports. In addition we have a close dialogue with local government (municipalities) that will be directly affected. We have done a structured stakeholder analysis, and have a strong consciousness regarding whom to involve.

It is also important to involve international investors, while at the same time secure local value creation.

**IQ #3B Are there stakeholders opposing your achievement of your objectives**

There is a lesser degree of opposition to offshore than to onshore wind power in our experience. The interest organisation "Motvind" is very outspoken and in strong opposition. There are also several fishing organisation that are concerned about the development. It is legitimate that professional actors are concerned about potential conflicts of interest, but there is a need for constructive dialogue. We expect that there will be more opposition in the construction phase of the offshore wind farm developments than what we see now. There is a need to give sustainability and nature preservation perspectives sufficient attention in the first developments.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

Public opinion is very important, and affects our actions directly. As an example we no longer develop new onshore wind farms due to the controversies. The whole organisation is affected by the public opinion. Our employees need local residents in their daily lives, and have to live with the choices the company makes. We also see that the licensing requirements are affected by the public opinion.

## **9.11 Interview no. 11**

### **Description of roles and objectives for the stakeholder**

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

We are part of a consortium that has many different roles within offshore wind development. Our company is a supplier to the wind farm developers, and aim at transforming the Norwegian offshore/shipbuilding industry. In addition to supplying built infrastructure we are also developing abilities to deliver technology consultancy services within the offshore environment and the current green shift that is on-going. This includes feasibility studies, pre-FEED studies and FEED-studies in itself. In this process we are hiring persons with competency from various novel areas for us, such as onshore grid development. We are currently also in a merger and acquisition (M&A) process with other offshore companies to be able to offer a stronger service in these fields.

We will not be owner nor operator of offshore wind farms, but rather designer and supplier of the equipment needed and consultants for the operators. As noted above, other parts of our consortium will have the role of owner and operator.

#### **IQ #1B What is the objective of your organisation in this future development?**

As a privately owned company noted on the stock exchange, our objective is to make profit for the owners. We believe we do that best through developing the industry to support the green shift and offering competitive products and services.

#### **IQ #1C Who determines the objectives of your organisation?**

The owners sets the objectives through the general assembly and the board of the company.

### **Drivers and barriers for large scale offshore wind development**

**IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

There are many views on this within our organizations. However, in my opinion one of the main drives of the development is the potential for building a strong and value creating supply-chain delivering equipment and services. We see a major market within these developments. Scale is a driver in and of itself, there is a large potential for value creation for Norway.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

There is a good alignment between the drivers behind the offshore wind farm developments and our objectives. We have an ambition to transform our business to deliver to the renewable industry, and would like to grow in this new market. In terms of numbers one third of our turn-around should be in the renewable business by 2025 and two thirds by 2030. These are very ambitions numbers for a company of our size. We also aim to be a 50 % emissions free company by 2030 and 100 % by 2050, in line with overall national ambitions in the field.

This is the foundation for future business for our company, and the green shift has a strong focus among management. This is also part of our core value. Not only being a passive participant in the green shift, but rather a pro-active stakeholder.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

The lack of standardisation and structures makes the implementation of large and ambitious projects difficult. There is also no regulatory framework in place for this development, and a mature market has not developed yet. There are challenges within the delivery chain for the building of the wind mills and other equipment that is needed. Few shipyard are able to deliver at these scales, and there will be a large demand for such equipment if these plans are to the realised.

There are also technology gaps, as several components needed are not yet developed. Cables, penetrators and other critical components could be developed until ~ 2025.

These needs to be in place before we can go further with this development. This constitutes a risk.

In summary, there are barriers on a regulatory level, structural level and technical level. There are many interfaces on all these levels, and it is hard to implement large-scale developments without standardisation.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

We need to be seen as optimistic and supportive of these targets. However, in light of the challenges named above they seem hard to achieve. This scale is equal to 150-200 nuclear power plants, and issues with integrating this into an onshore system is vast. There is a need to look at how all this power can be utilized without having to transport it deep into the transmission network in Norway and Europe. Local consumption and other ways to transport the energy needs to be investigated. It would be an advantage if the consumption was located in immediate vicinity to the production. A possibility is to place flexible consumption offshore, for example in the form of hydrogen production. You need to consume the power when the wind is blowing.

A power grid that is to handle the vast variability that is expected from these offshore developments needs to be built in a different way than we have traditionally built power grids and systems.

### **Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We are cooperating with many other stakeholders. For us sub-suppliers are specially important in order to be able to deliver our services. The consortium that we belong to has a wider contact with other stakeholders.

**IQ #3B Are there stakeholders opposing your achievement of your objectives**

There are of course competitors that are competing in the same market as us. In addition to the we have had some opposition to our traditional business within oil and gas, but very little within our renewable activities.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

We are affected by public opinion to a rather large degree. We are dependant on a good reputation, both in order to get contracts but also in order to get new employees. It is important to have a green profile when attracting new staff, also with regards to the gender balance.

## **9.12 Interview no. 12**

### **Description of roles and objectives for the stakeholder**

**IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

We are a distribution company operating within the framework set by NVE. Our role is first and foremost to facilitate for electricity production, distribution and consumption in our area. offshore developments is mostly expected to directly affect the TSO, but the service and supply industry to support the offshore activities is expected to be located in our distribution grid. Hence, the large scale development of offshore wind farms is expected to affect our grid, but in a more indirect manner.

**IQ #1B What is the objective of your organisation in this future development?**

Our objectives are set by regulations concerning the operation of DSOs i Norway. All customers are to be treated equally and choices are to be made in a socioeconomic optimal manner. Offshore power generation will be treated as any other generation unit. However, We do expect that these developments will be connected to the transmission grid operated by the TSO.

**IQ #1C Who determines the objectives of your organisation?**

As noted above our objectives are determined in regulation by the NVE and RME.

**Drivers and barriers for large scale offshore wind development**

**IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

The main driver as seen from our organization is the expected increase in consumption of both electric energy and power. We are approaching a power deficit that has to be covered by new generation or import. As a DSO we do not have opinions on which technologies that are to cover this expected deficit, but we are facilitating for the introduction of new generation capacity.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

We have considerable experience in treating actors equally, and personal opinions will to a very limited degree influence our choices. If the above mentioned deficit is to be covered by offshore wind farms, then that is OK as long as this is socioeconomically sensible and done in a just manner.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

We have no strong opinions on barriers. However, we would like to point out that the socioeconomic evaluations concerning large scale offshore wind farm developments are not in agreement. Specially this concerns the foundation (input data and assumptions) and results of the analysis. In particular the non-quantifiable variables in the analysis that needs to be taken in to account such as environmental and visual affects. Providing a fact based and transparent foundation for analysis is difficult. Non-quantifiable variables are specially hard and requires a holistic treatment.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

We have not performed any analysis on this ourselves in our power system investigations and projections (*kraftsystemutredninger*, KSU) as this does not directly influence our grid. It may or may not be the case that we are directly affected, offshore wind may be the solution for covering the expected power deficit. The KSU has a 20 year perspective, but offshore wind generation does not have a significant place in these.

### **Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We are working closely with other grid operators, in particular the TSO but also the neighbouring DSOs. The connection to the grid of consumption near the boarder of our grid-area is a typical case where there is close interaction with other grid operators.

We have considerable collaboration with local governments (municipalities, counties) to ensure proper facilitation of both production and generation. In the same manner we have extensive dialogue with costumers such as producers. It may be that in the future this will include offshore wind farms.

**IQ #3B Are there stakeholders opposing your achievement of your objectives**

There are few actors that oppose the existence and operation of distribution grids in general. Licensing processes are seeking input from many stakeholders, and there is some *not-in-my-backyard* mentality present. There is also the interest group *Motvind* that is against all developments, and they are making their voice heard at every opportunity. We also see some opposition in the form of demonstrations at the start of construction for some of the plants that we are building.



**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

We are not directly affected by the public opinion. However, we are in dialogue with land owners and other actors that listen to the public opinion, and their opinion and actions are shaped by the general public opinion.

We cannot only do things that makes us popular, we also need to do what is correct according to our objectives. On the other hand we are owned by municipalities that are influenced by the public. In the same manner the NVE is affected by the public opinion, and is to some extent under political influence. Therefor we are indirectly affected through these channels.

### **9.13 Interview no. 13**

#### **Description of roles and objectives for the stakeholder**

**IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

We have a role as a regulator. Our final role in the offshore developments is not yet determined, it is up to the department (OED) to decide this. We do expect roles and responsibilities to be delegated from the department. We are currently investigating potential areas for offshore wind farm developments and their suitability.

The ocean energy law (*Havenergiloven*) is organised under OED, and not under any directorate. We may get an advisory role and responsibility for detailing the licences, however this will be after the department has granted the licenses. It is the department that has the licensing authority. This partial responsibility for detailing has been delegated in the past for special cases.

**IQ #1B What is the objective of your organisation in this future development?**

Our objective is to facilitate for a balance between production and demand of energy in Norway. Towards this end, security of supply is central. We have a mandate to

do this in an sustainable and environmentally friendly manner. In all cases the advantage needs to outweigh the drawbacks. We need to secure that we have the needed energy without this causing unreasonable consequences for either the society nor the environment.

**IQ #1C Who determines the objectives of your organisation?**

We are placed under the OED who is the "owner" of our organisation and is the manager of the ocean energy law. The department also has its own section with focus on offshore wind energy. This section has its own management. It would be beneficial to interview them on their views. (Note by author: A request has been sent to OED for an interview with this section, but no reply has been received).

**Drivers and barriers for large scale offshore wind development**

**IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

The main driver is to secure sufficient energy for future needs in Norway and to reduce the emissions associated with energy production.

There is of course also a drive to make a profit from these developments. Value creation both for companies and for society as a whole is always an argument and driver behind the scene. Some individuals and companies sees a major potential for profit in these developments.

However, there are also considerable potential for jobs and value creation for large parts of Norway in this development. These projects could transition us out of an oil and gas focused economy into a renewable and sustainable society. Infrastructure industry and supply-chains could generate a broad value creation for the Norwegian society.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

There is a good correspondence between our objectives and the drivers identified above. Our objective is to secure future availability of energy to Norway, and large scale offshore wind farm developments aids in this manner and helps in terms of security of supply.

There is less alignment with respect to the amount of nature intervention that is needed to realise these developments. The scale of the developments necessitates substantial interventions in the ocean space that will have consequences. We shall not build these wind farms regardless of their environmental footprint. The advantages must outweigh the drawbacks.

On balance there are more alignment than miss-alignment.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

The greatest barrier is the complexity of the ocean. It is a challenging job to find the areas where the conflict of interest is lowest and there is the fewest consequences for the environment.

It is specially important to find areas that are not conflicting with the fisheries and marine life in general. Good dialogue and good processes are needed to minimise potential conflict. There is a desire to build at a minimal cost, but it could be necessary and/or desirable to build at more costly areas due to environmental interests or other commercial interests.

If the opposition in the public becomes large enough this may put a stop to the offshore wind developments. This could be very similar to the onshore situation we have experienced. This could cause a substantial barrier.

It is also a barrier that the onshore system needs to be capable of receiving the generated power. In this regard we need to build both a suitable onshore grid and also look at storage technologies and interaction with other energy carriers such as hydrogen or heat. In the short term it is very important where this power is taken onshore.

The offshore wind energy is intermittent, and there needs to be sufficient balancing capability to handle this uncontrollable variation.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

We as an organisation would not like to make a statement about this likelihood. We can however state that the required areas needed for such a development is present, but there are many considerations that needs to be taken into account for their utilization.

It is still too early days for making a call on this. Only two areas has been considered so far for licensing, and there are many other aspects that needs to be resolved before these developments are realised.

On a general note it is our opinion that 150 GW for DE/DK/NL/BE will be more intensive in terms of area exploitation than 30 GW for Norway that has large ocean areas available.

It is hard to predict about the future.

## **Cooperating and competing stakeholders**

**IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We are cooperating closely with the TSO Statnett and the major power producer Statkraft.

There is also formed a cooperation group between the various directorates involved, and there is a tight working relationship there.

In general the ocean is very complex, and there are a lot of stakeholders. Among these are the research organisations that help form a knowledge base upon which these developments are to be built. In addition to the research organisations, various special interest organisations and commercial representatives are relevant.

### **IQ #3B Are there stakeholders opposing your achievement of your objectives**

All special interest organisations fight for their particular interests. This could be in favour of or not in favour of large scale offshore wind developments. Most are in favour of the developments in general, but fight for their aspects. Some organisations, such as *Motvind*, are against all developments, but they are few.

Several stakeholders have raised the need for better mapping of the areas considered. This includes the collection of topological data and time series concerning marine life and weather. The collection of these time series is very time consuming and should be started as soon as possible.

### **IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

We are a directorate founded on scientific principles and knowledge based decision making. This guides our work. We are though however under political management, and this affects which tasks we choose to work on and our prioritization.

The public opinions should not be underestimated with regards to its ability accelerate or stop processes.

## **9.14 Interview no. 14**

### **Description of roles and objectives for the stakeholder**

#### **IQ #1A What is the overall role of your organisation in the offshore wind power sector?**

Our role is to be an accelerator for the green shift and for the reduction of emissions. Offshore wind is important for this as it provides an alternative renewable energy source as a replacement for fossil energy sources. This is the case both for Norway and for Europe.

We are an instigator for the shift away from fossil energy source, and we are working actively to speed up the process. There is need for more renewable energy in the world.

**IQ #1B What is the objective of your organisation in this future development?**

Our objective is to support and accelerate the green transition.

**IQ #1C Who determines the objectives of your organisation?**

We are a foundation, and formally the board sets the objectives of our organisation. The objectives are however in practical terms set by the employees of the organisation, and operationalised by the general manager. We are for the most part founded by a broad spectrum of commercial actors, and have only 2-3 % public funding (*grunnbevilgning*).

**Drivers and barriers for large scale offshore wind development**

**IQ #2A What do you and your organisation see as the major drivers for the development of large scale offshore wind power production?**

The major driver for society is to build new industry and sustained value creation in addition to being a new source of energy. The aspects related to being a new energy source that could replace fossil fuels is the most important one for our organisation.

Both Norway and Europe need new energy sources to meet their emission targets. In addition, Europe is currently having a large focus on security of supply and becoming self-sufficient in terms of energy to a larger degree. This is less of an issue for Norway in the short term.

Another driver is the fact that these developments are placed far out in the ocean where fewer people will see them. There will therefor potentially be less opposition against them as the *not-in-my-backyard* issue is to a large degree avoided.

An independent driver for large scale developments is the expected economy-of-scale effects that will lower the average price for electric energy.

**IQ #2B To which degree are the objectives and perception of drivers aligned between your organization and the individuals within the organization**

There is a good agreement between most of the drivers for large scale offshore wind developments and the objectives of our organisation. We are more focused on the emission reduction aspects than the building of supply chains.

**IQ #2C What do you and your organisation see as the major barriers for the development of large scale offshore wind power production**

Profitability is a major barrier. In a short time horizon this is not a problem, but we expect the power prices to fall to lower levels over time. offshore developments need to be profitable over a considerable time horizon. Access to markets that are willing to pay a higher power prices than Norway may be crucial in this respect. Connection to these markets is a potential barrier. How to ensure an effective grid is a central question.

offshore wind developments is a highly political topic as we have seen in the recent political debate. There is also an advantage in building the wind farms close to the demand centres, but this may cause larger conflicts with regards to area availability. Co-existence with already existing interests such as fishing needs to be managed in a productive manner. We as an organisation are optimistic with regards to this topic as we believe that the ocean is large enough to accommodate both interests.

Another major barrier is the availability of resources such as minerals and other raw-materials. This may become a geo-political conflict area where it is not the price but rather the availability that is the issue. This is related to the difficulty of creating a sufficient delivery-chain in time that can build the needed infrastructure.

A different kind of barrier is the level of objectivity and fact based discussion taking place in the public debate. If the need for new renewable energy is questioned, the development of new offshore wind farms may be more difficult.

**IQ #2D How likely do you think the realisation of the development plans (NO: 30 GW in 2040 awarded, DE/DK/NL/BE: 150 GW in 2050 built) are**

If Norway is to meet its net zero-emission targets there is a need for  $\sim 100$  TWh

just to replace the fossil fuels we are currently using. A deployment of 30 GW offshore wind capacity will potentially produce 140-150 TWh. A development of this magnitude is therefore required for Norway to meet its targets. The situation is similar for the 150+ GW offshore wind energy further south.

Balancing all this power is a major challenge, and it will be difficult to prepare the energy system for so rapid introduction of this intermittent power. It will require a stronger grid and more consumer flexibility. Here hydrogen production may play a major role.

In general there is a need for building an energy system with closer interaction between the energy carriers. This will facilitate larger flexibility and a greater ability to handle large variations in power generation. If power generated by fossil fuels are going out of the energy mix, something else must come in.

Today the spot-price only gives consumer short-term behavioural incentives 24-36 hours ahead with regards to load-shifting. In an energy system where wind and solar are dominating, there may be a need for larger planning horizons in order to achieve the needed consumer flexibility. Based on weather forecasts and other forecasting techniques it may be possible to give price signals as far as 7+ days in advance for consumer planning.

## **Cooperating and competing stakeholders**

### **IQ #3A Which other stakeholders do you see as cooperating partners for achieving your objective**

We are cooperating closely with a wide range of commercial actors, including offshore wind farm developers. This is done in order to learn and being able to develop good solutions towards a net zero-emission society rapidly and cost efficiently.

We have a saying that the climate issue is our employer (*"Klimasaken er vår arbeidsgiver"*). This gives guidance on who we are cooperating with. Dialogue with commercial interests is needed to solve the climate crisis.



**IQ #3B Are there stakeholders opposing your achievement of your objectives**

There are few entities that are negative to these developments. Some environmental organisations and one political parties (Rødt) have stated their opposition to this. They are however not very influential.

Dialogue with other interested parties and good design of the projects will lessen the potential conflicts and reduces the number of stakeholders that opposes the developments. An example of this is the consideration of the impact on fisheries. Such considerations make the debate more nuanced and removes the strong yes/no focus. This leads to a more constructive debate.

**IQ #3C To which extent is public opinion relevant for the choices of your organisation and shaping your actions**

We are all affected on an individual level by the public opinion to some degree. However, as an organisation we look for good political solutions, and this is strongly impacted by public opinion. The debate concerning the hybrid cables is a good example of this. What we as an organisation holds as an opinion is not affected, but which problems we work on is affected.

## 10 Appendix B - Power market theory

There is a vast and varied literature within market theory, and many aspects could be raised. In this context however, only a brief introduction will be given so as to function as a basis for the discussion later in this thesis. Unless otherwise stated the description is for the European power market that Norway is a part of.

Electricity is in most parts of the world today traded as a commodity much as any other commodity such as oil, steel and rice. There are however some special aspects of electric power (hereafter only called power) that makes it stand out from other commodities. The first of these is that production and consumption of power must at all times be in balance. If there is not enough production to meet demand the frequency will decrease, and if there is excess production that is not consumed the frequency will increase (PÉREZ-ARRIAGA and BATLLE, 2012). In order to facilitate for as good a balance as possible through the use of markets, there are several power markets stacked in time. The largest and most discussed such market in Europe is the spot-market where the market is cleared every day at about 12:42 for the following day (from midnight and the subsequent 24 hours) with an hourly resolution. There are both markets with longer time horizons (for example long-term direct power contracts between a producer and a consumer) and shorter time horizon markets such as the intra-day market and the imbalance market (Shah and Chatterjee, 2020)

The spot market is cleared every day based on the bids from a set of producers (sellers) and a set of consumers (buyers) at a number of power exchanges. The aggregated set of seller bids form the *supply curve* and the aggregated set of buyer bids forms the *demand curve*. This is illustrated in Figure 4. Note that the specific shape of these curves, the merit order of the production technologies and the crossing point is only meant to illustrate the principle of price formation and may change considerably. Where the supply curve and the demand curve crosses denotes the power price and the amount of power traded. This is done for each price area.

There are several price area within the European power market. The areas are illustrated in Figure 5 where data from NordPools market platform (Nord Pool Group, 2022) is presented. Note that there are for example five price areas in Norway, two in Denmark

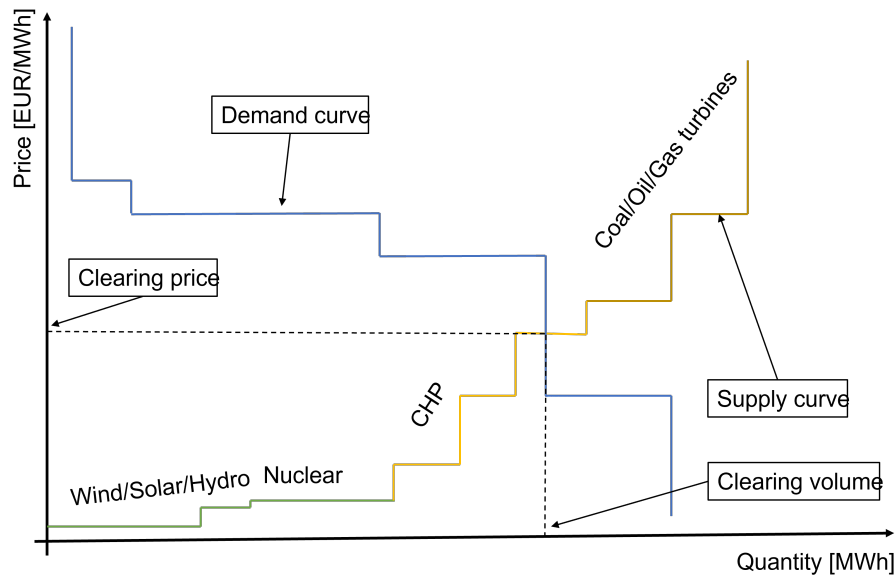


Figure 4: Illustration of the principle of bidding curves. Note that the merit order for the generation technologies are meant for illustrative purposes and may vary. The figure is inspired by (Klessmann et al., 2008)

and one in Germany. Note also that the price per area differs between some of the areas and that there are power flow generally from areas with a high price to areas with a low price. The fact that the price varies between areas indicated that the power exchange between two areas needed to equalize the price between them exceeds the available capacity, and a bottleneck is formed (Wangensteen, 2012). Import and export from a price area will impact the crossing point of the supply and demand curves, but this is beyond this brief introduction.

The spot market is of interest when it comes to the discussion of off-shore wind power production. It is however interesting for the wind farm actors to look at which services they would supply or take advantage off with regards to their balancing needs in the shorter markets and also what kind of long term reliable security they could gain from the longer markets. This is however outside the scope of this discussion and will not be treated in this thesis.

Any producer of power is obligated to selling its power in the price area where it is connected. The transfer of power from one price area to another with a different power

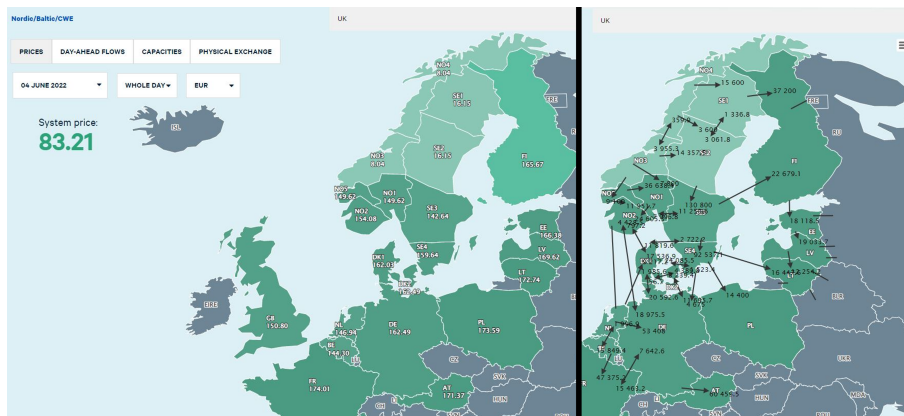


Figure 5: Map showing the price areas for Northern Europe including the system price, the area prices and the power flow between areas. The figure is obtained from Nordpools web-page.

price will result what is known as bottleneck revenues. These mainly go to the owner of the transmission line, often a Transmission Service Operator (TSO). In Norway this is Statnett ASA.

With the rapid development of the off-shore wind farm production and the large amounts of energy produced where there traditionally is no consumption, it is an open question how the price-area structure will be impacted. One possible future arrangement is the construction of an off-shore bidding zone, and the construction of a masked off-shore grid where power flows between a set of off-shore wind farms and a number of on-shore price areas. In this case the distribution of production costs (wind farms and grid) and the market structure (bidding rules, bottleneck revenues and general interoperability) is currently being evaluated (European Commission and THEMA Consulting, 2020).

## 10.1 CfD - Contracts for Difference

A contract for difference (CfD) is a general term within financial services. However, in the context of offshore wind farms this is a mechanism whereby the operators of the wind farms are guaranteed a minimum price for their power. This price is known as the *strike price*. The operator will sell their power in the market as normal, and if the price is above the strike price no extra compensation is made. In some instances the operator will need

to pay any surplus back. If the operator's achieved price is below the strike price, the difference is compensated for.

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