# How has Wind Power Developed in Norway?

A longitudinal study utilising the multi-level perspective to analyse the transition of Norwegian wind power from 2000 – 2020.

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# Preface

This thesis marks the end of my undergraduate studies at the University of Stavanger. I decided to choose this topic as it is one that I have found myself discussing countless times with both friends and family over the past two years. As every good researcher, naturally, I have attempted to not let my own opinions influence the approach of the research process. However, during the planning process I have encountered several challenges that sprung up along the way, such as deciding which on the many interesting areas related to my topic to focus on. Some of these alternative research questions, to name a few, were "what makes people protest wind power developments in Norway?", "what impact does foreign investment have on Norwegian wind power?", and "has the European Union impacted the wind power development in Norway?" were all good candidates for my thesis. However, as I began my research, I found myself more interested in covering elements that have been facilitated by energy policies, both abroad and domestically, which have in turn influenced the current temporary halt in licensing and the renegotiating of wind power policy in Norway. I, therefore, ended up proceeding with a slightly more holistic approach than I first imagined back in January 2021. My goal of this research thus led to the aim of learning more about Norway's political process in wind energy and see how they have been affected by other influences. Hopefully, my findings will make the whole transition clearer to the reader and can inspire further research related to Norwegian wind power policy and development.

First and foremost, I would like to thank my supervisor, Benjamin Ronald Silvester, for giving me invaluable feedback throughout the whole research process. Your reflective feedback on my ideas, especially by guiding through adequate theoretical approaches and motivating me to follow through on the interview planning process, have had a significant impact on the result of this thesis. This brings me to my informants whom I would also like to express my deepest gratitude for agreeing to attend my interviews, for sharing their expert knowledge and for letting me use this in my research. I would also like to especially thank one of my informants who referred me to my next, highly relevant, informant. Finally, I want to thank my closest ones for great discussions about this topic throughout this semester. You have all been extremely helpful.

Thank you!

Kristoffer June 2021

## Abstract

This thesis examines the timeframe of 2000 – 2020 focusing on how Norway's development of wind power has been impacted by domestic and non-domestic influences, such as the European Union's Directive for Renewables Act 2009 and Germany. The thesis argues that Germany in particular has been an important external actor to Norway, and thus this thesis provides a review of its policy development of renewable energy sources and how it has fostered technological growth and cost-reductions within the wind power sector, which in turn have influenced wind power development in other countries, such as Norway. I then explore several important policy directions that were taken and the goals that were set in the Norwegian Parliament throughout the last twenty years. The analytical approach of this thesis utilises the Multi-Level Perspective. This framework is used in order to explain the transition that has happened throughout the chosen timeframe, and how certain elements influence and/or facilitate other factors on other levels to change. The findings of this thesis shows that Norway's wind power development, despite being influenced by non-domestic entities, has mostly been facilitated and impacted by its' own political directions chosen in the Parliament. However, it is indicated that Norway has been affected by the EU's Renewables Directive by stimulating a political will to commit to wind power. In addition, Norway's collaboration with Sweden to create a common market for green certificates trading, but with slightly different support schemes (when compared to Sweden), also is likely to have impacted wind power development in Norway. The thesis refers to findings from relevant literature as well as the data gathered from conducting three interviews with high-level informants, who provided valuable insights on Norwegian wind power developments.

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# 1. Introduction

Over the last decade, the electricity production from wind power has increased in Norway. The number of wind power facilities has grown and so has the efficiency, also described as *capacity*, i.e., the maximum energy output at any given time (Mueller, 2020) of each wind turbine (OED, 2019; Energifakta Norge; 2021; SSB 2018). In 1999, the Norwegian Parliament agreed on a goal to reach a yearly production of 3 TWh from wind power by 2010 (OED, 1999), however, this goal was not reached due to a lack of political will to construct a robust and predictable support scheme for attracting enough development in the timeframe (Blindheim, 2013: 344). Only a few years prior to this target's deadline did the Norwegian government begin discussions on implementing a support mechanism for renewable energy sources (RES). The prospected solution for such a scheme was one where they would grant green certificates to facility owners of RES. This ultimately led to the creation of a market for green certificates trading in collaboration with Sweden in 2012 (OED, 2015; Finjord, Hagspiel, Lavrutich & Tangen, 2018). Earlier studies, along with informants interviewed in this study, have pointed out that the ambition for Norway to join Sweden's market for green certificates trading could be a response of the European Union's Directive for Renewables Act 2009, where Norway were obliged to keep the percentage of total energy consumed by renewable energy above 67,5 percent (Gulbrandsen, Inderberg & Jevnaker, 2021: 9). The following year of Norway's failure to meet its 3 TWh target from wind energy, 85.1 MW of new wind power capacity was installed, leading to a capacity of 511.5 MW from wind power at the start of 2012 (NVE, 2012: 30)[1]. However, in 2017, there was more wind power under construction than all the already installed total capacity from wind power up to that point (NVE, 2018). This was, arguably both due to a more attractive support scheme policy, and technological developments increasing the efficiency and reducing the costs of wind power.

[1] It is important to note the difference between TWh and MW. The number of terawatt hours (TWh) from wind power of 2010 explains the total amount of energy produced from that resource during that year, while megawatts (MW) capacity, as noted above, is the maximum output of energy every second, at any moment, given that the turbines run at full blast.
For more information, see: https://www.confusedaboutenergy.co.uk/index.php/energy-resources/756-what-is-a-kwh-what-is-a-twh

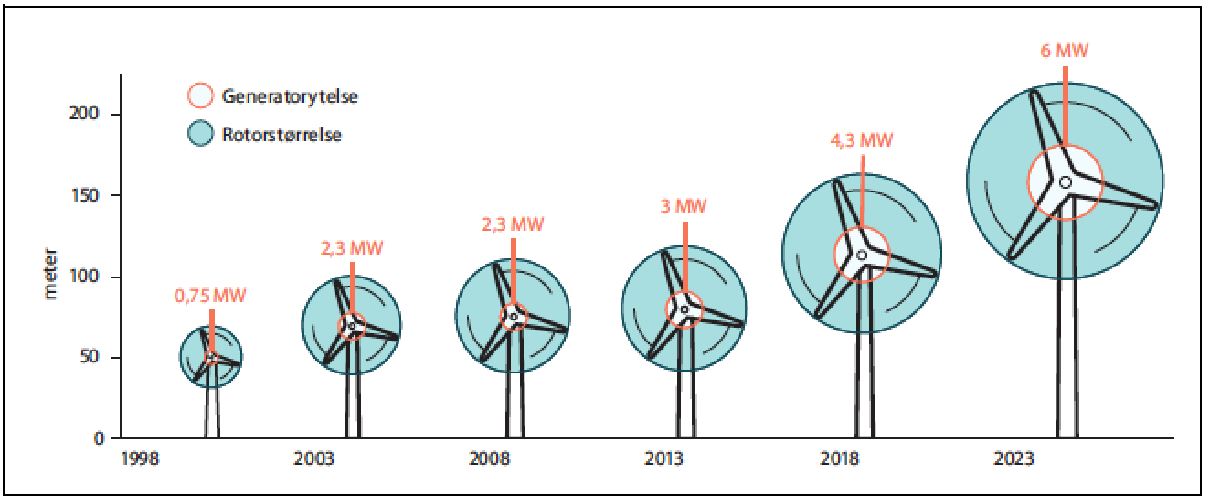


Fig. 1. The evolution of wind turbine size. Source: OED, 2019

The height of the turbine illustrates the maximum height, but the size of the circle illustrates the relative development of the generator's efficiency and the rotor's size. The 2023 size is an estimation.

The development of wind power in Norway has been a result of its ambitious goal of being more independent in its electricity production, increasing its security of supply (OED, 2001) and continuing to follow its obligations from the EUs Renewable Directive of 2009, to stay above 67,5 percent of energy consumption from RES (OED, 2015). From 2016 to 2021, the installation of wind power capacity rose from 873 MW to 3,977 MW. The consequence of the construction of more wind power in Norway has fuelled resistance that has led to protest mobilisations and public debates surrounding wind power development (Lysgård, 2021: 2). Studies on how The Norwegian Water Resources and Energy Directorate (NVE) weighs energy production against the negative environmental impacts have shown that they put a high criterion on the facility's potential capacity if it is even going to be considered in areas where negative impacts are controversial (Gulbrandsen et al, 2021). However, these details have not been that clear for citizens, which have made an issue of a lack of transparency and predictability of Norway's wind power development (Inderberg, Rognstad, Saglie & Gulbrandsen, 2019).

In this thesis I focus on the evolution of wind power in Norway and investigate which elements have influenced the political will to facilitate this renewable energy source. I analyse the effects of Norway and Sweden's common market for green certificates, while also looking at how Germany's renewable energy policies has influenced wind power development in Norway. An important document source for this thesis are white papers from the Norwegian Government and related Ministries, as they speak to the 'official' statements and formulates their thought processes and considerations on wind power development. As such, my thesis looks to address the following research question: *How has the transition to wind power in Norway been affected by external influences, and have these, subsequently, had an impact on how wind power has developed in Norway?* To answer this, I examined the impact of Norway's implementation of the common green certificate market with Sweden has had on wind power development. Additionally, influences from non-domestic entities such as the EU and Germany's policies on renewable energy were also explored. This approach considers how Norway has responded to developments, looks at which policies that were implemented and why, and examines the consequences of these changes. This thesis has also utilised previous empirical findings collected from peer reviewed research articles, documents, and news articles. In addition to this, data from interviewing two highly relevant stakeholders and an expert research informant with intimate knowledge in the field of Norwegian wind power policy was also used to both inform and guide the writing and researching of this thesis. I applied the collected data and utilised the *Multi-Level Perspective* (MLP) to analyse the transition of wind power development in Norway. The MLP framework will be explained along with the justification of its utilisation in this research at the end of section 2, right after I explain why we apply analytical frameworks in studies like this. In section 3, the methods of this research are presented. Thereafter, in section 4, I present an overview of Germany's policies for renewable development, i.e., the *Energiewende*, and its effects on wind power development, which I argue is highly relevant to the transition of Norwegian wind power. Section 5 brings the focus back directly to Norway's situation over the past twenty years and bridges the transition to the following section 6, where I go through the findings from the interviews. These findings, along with the rest of the essential literature presented throughout this thesis, are then discussed, and applied to the MLP in section 7. Finally, section 8 concludes that Norway's wind power policy has mostly been influenced by its' own political steering, but also indirectly by the EU and Germany.

# 2. Analytical framework

## 2.1 Theories for policy process- and transition studies – why we use them and how we decide on which ones to utilise

When research is conducted on how political systems have facilitated socio-technical transitions, a look at policy changes can provide important insights (Markard, Suter & Ingold, 2016: 217). In this, utilising frameworks for analysing transitions and policy processes can be helpful. Firstly, it aids us in approaching the research and guides our analysis systematically. Secondly, in studies where researchers are after the precise knowledge which has led to certain societal responses, their findings will help us determine possible outcomes of future policy implementations and their success (Sabatier, 1991: 148). Furthermore, studies utilising befitting frameworks are also helpful in strengthening the theoretical approach further, as research where it is being used would act as a trial-and-error process and thus, over time, enhance its potency (Kern & Rogge, 2018: 103; Geels, 2002: 1273). In transition studies there are several approaches that researchers can employ. Some frequently used ones are presented in Kern and Rogge's (2018) *Harnessing theories of policy process for analysing the politics of sustainability transitions: A critical survey*. The choice of which theory to resort to is based on which elements in the transition the researcher is focused on explaining, or what their hypotheses are of why a policy turned out a certain way (Kern & Rogge, 2018: 103). For instance, if a researcher is focusing on explaining a policy process' influence on a variety of societal factors and feedback from the public, they could benefit from utilising the well-established approach *Policy Feedback Theory* (PFT). This theory's main concern is how the politics is reshaped post-policy implementations, and how these will further affect future policy transitions (Kern & Rogge, 2018: 109). However, PFT would arguably not be a useful approach for a researcher who is mainly focusing on the development of the agenda setting in a specific policy process (Kern & Rogge, 2018: 112). The PFT could be useful in this paper if I would choose to focus on the potential future of wind power policies in Norway, instead of a longitudinal study focusing on the external influences on wind power development. Naturally, Kern and Rogge (2018) does not argue which theory is better than the other. Instead, they explain which theory would be most applicable depending on the area of focus and the topic that is being researched (Kern & Rogge, 2018: 114).

In the research process of this thesis, I began by utilising the *Advocacy Coalition Framework* (ACF). This framework suits policy process studies focusing on actor's influence on policy changes. The main idea here is that policies are formed by coalitions, which consists of multiple actors, with sharing 'belief systems', within a specified field, e.g., a market which the policy regulates, where they cooperate to reach their goals. These coalitions will compete with others, with differing beliefs, to influence the policymaking in their favour. (Sabatier, 1991: 151-152). 'Belief systems' determine the ways in which actors behave in their surroundings, e.g., which values one organisation has to the instruments to use to reach a goal. The ACF distinguishes these systems in three levels (Kern & Rogge, 2018: 104; Sabatier, 1991: 153), but for simplicity's sake I will skip explaining this stage. In short, my first hypothesis was along the lines that actors from multiple backgrounds, domestic, international, public, and private, etc., came together to form coalitions that resulted in a policy which supported wind power development in Norway. It is important to note that actors' goals can be vastly different within one coalition, even if they all agree to utilise the same instrument to realise their goals. One actor's goals might have been to generate economic profits through green certificate trading, granted by developing wind power, while politicians facilitated a policy which enabled this, with the goal to reduce dependency on non-renewable energy sources. The ACF states that policy changes happen due to changes in these actor's belief systems (Markard, et al., 2016; 218). This first hypothesis could very well be true, as several recent news coverages would complement it, e.g., Øverbekk, Andersson and Holstad (2018), and Engen and Oddstad (2020). But conducting research on it would require far more resources than was at my disposal. However, after conducting the first interview, I found that this hypothesis might be further from the truth than I first thought. Hence, a new hypothesis was formed along with selecting another more befitting framework for this research, the *Multi-Level Perspective*.

## 2.2 Multi-level Perspective

The *Multi-Level Perspective* (MLP) is an exceedingly applicable framework for a vast range of studies of linkages between technical and social elements (Geels, 2002: 1259). It is a heuristic approach, i.e., one that may not be perfectly optimal, yet still adequately sufficient for answering difficult questions (Kahneman, 2011: 98), and thus can help to find more satisfactory methods for future research, and aids in analysing and addressing how transitions and regime shifts happen (Geels, 2002: 1257, 1273; Geels & Kemp, 2007: 442). Although the MLP is a complex framework, it is briefly, yet understandably explained in Frank W. Geels' (2002) article, *Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case study*. Here, he demonstrates by utilising the MLP in long-term case-study to explain which elements facilitated the transition from sailing ships to steamships from 1780 to 1900 (Geels, 2002: 1257).

There are multiple factors that facilitate technology evolution. Geels builds the approach by leaning on the concept of *technological regimes*, by Nelson and Winter, 1982 (Geels, 2002: 1259; Geels & Schot, 2007:399). Technological regimes are, in short, a cluster of cognitive routines in the sector of technology development. The actors within these sectors constantly create what Geels calls *technological trajectories*, which essentially are attempts for the evolution of innovating technology in multiple directions. The evolution of new technology springs from the bottom, micro-level of the MLP, which is categorised as *niches*. Niches are essentially "'incubation rooms' for radical novelties, shielding them from mainstream market selection … [however they] may have the form of technological niches, where resources are provided by public subsidies or private strategic investments" (Geels & Kemp, 2007: 443). Naturally, the successes of these trajectories are, at the end, bound by outside elements such as markets, user practices, suppliers, demand for innovative change in technology, public authorities, and policy regulations to name a few. Together, these established elements define the *socio-technical regime*, which is the meso-level of the MLP (Geels, 2002: 1260-1263; Geels & Kemp, 2007: 442, 443). The macro-level of the MLP is the *socio-technical landscape*. The landscape differs from the regime because it consists of robust, difficult to change elements, i.e., the materials which civilisation depend on, which in turn are affected by diverse factors such as normative values, growth of the economy, and changes in the environment (Geels, 2002: 1260). I would argue that elements such as international relations, supranational governance, cross-border co-operation, and natural resources should also be included here. Fig. 2 illustrates how the three levels of the MLP interact.

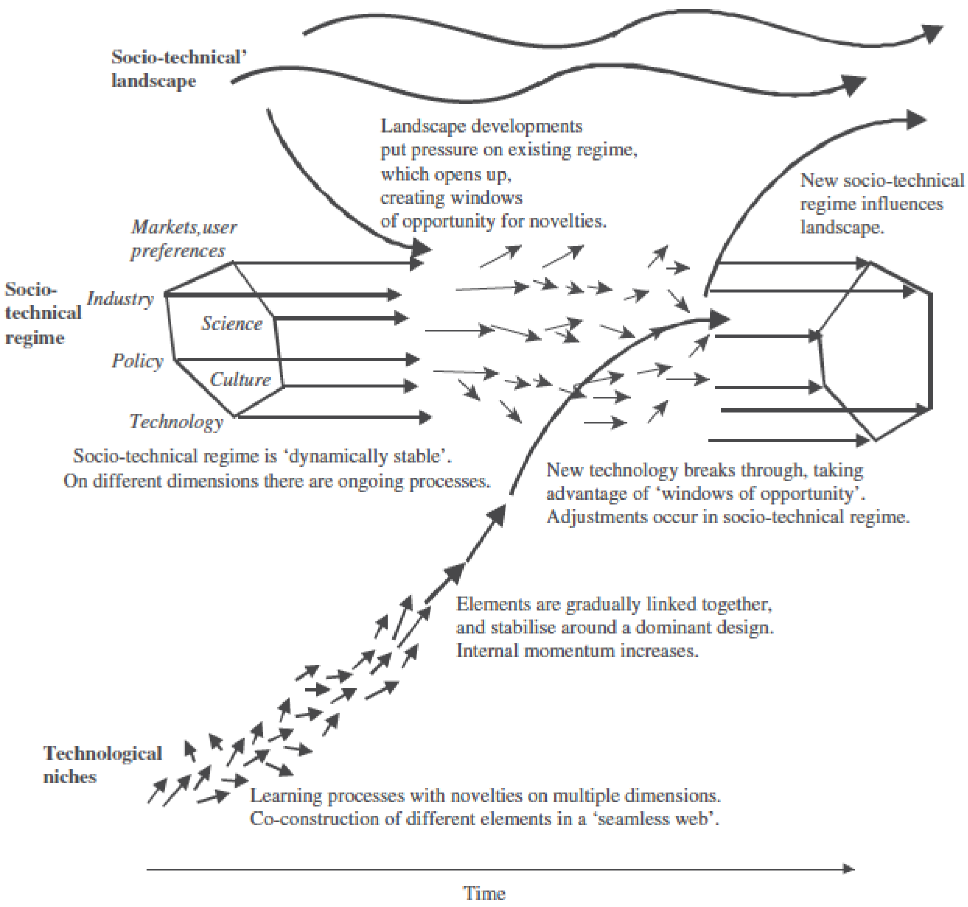


Fig. 2. A dynamic multi-level perspective on technological development.

As shown in Fig. 2 there are several ways the socio-technical regime and landscape can be influenced. One part of the illustration I would like to specifically point to is the arrow which stretches from the upper left, from the socio-technical landscape, down to the regime level. This arrow illustrates one important point of the MLP which is that the success of technology transitions not only depend on its competitors and the established rules within the industry, policies, etc., but also changes in the landscape can pressure the existing regime to change, or 'open up', for new solutions to be implemented. Changes at the top level can thus explicitly stimulate specific innovation (Geels, 2002: 1261). The second arrow I would like to highlight is the thick arrow which enters the socio-technical regime from below. It illustrates how the micro-level, e.g., new solutions that turn out to be successful, can start influencing the establishment in the regime, i.e., markets, user preferences, the industry, existing technology, and policies.

## 2.3 Defending the choice of theory and a presentation of the hypothesis

The Multi-level Perspective is a befitting approach to utilise for the research analysis of this thesis. Firstly, this is because changes at the socio-technical landscape, i.e., climate- and environmental changes and the political acknowledgment of this challenge, have stimulated changes in the regime-level through adaptations of multiple strategies to confront these challenges (United Nations, 2015: Article 5.2; OED, 1999). This has created windows of opportunities for technological innovation, i.e., the implementation of policies to facilitate or stimulate the development of alternative sources of electricity (Teng, Lu & Chiu, 2020; Rigel, 2005; Hake, Fischer, Venghaus & Weckenbrock, 2015: 532). In contrast to the ACF's explanation of policy changes occur due to actor's beliefs changing, the MLP emphasises that changes also depend on the technology available and the demands from the whole structure of the socio-technical regime (Markard, et al., 2016: 219). Policies both affect and are affected by elements on all levels, and are in sustainable development transitions most often a result of difficult political decisions (Meadowcroft, 2011: 71). The two arrows previously mentioned from Fig. 2. illustrates this, however, the figure may not perfectly illustrate that policy changes also depend on which technologies are at the disposal and are a wise choice to encourage investing in (Meadowcroft, 2011: 72). As we will see later in this text, political decisions have created policies which have specifically encouraged technological trajectories through subsidising innovation in wind power technology as a transition to renewable energy sources (RES). This has been the case in Germany with its' *Energiewende*, which is the common term for Germany's energy transition to renewables[2]. Others have implemented favourable market schemes where investors are drawn to invest in the development of the technological innovations due to green certificate grants and high demands for power purchase agreements[3]. The data gathered from my interviews gave me the impression that the policies which have facilitated wind power development in Norway both is a result of domestic political decisions and non-domestic influences, more specifically, policies from the EU and other EU countries. Therefore, the MLP was chosen as the analytical framework in order to capture the significant scope of influences relevant to Norwegian wind power development.

[2] This will be further elaborated on in section 4.
[3] Green certificates will be further elaborated on in section 5, and power purchase agreements in section 6.

# 3. Methods

## 3.1 Selection of methods

To obtain the information needed for evaluating the wind power actors' involvements and the degree to which they have influenced Norway's wind power development, I utilised several research methods. Firstly, I present relevant findings from peer reviewed articles that research the topic of wind power developments, sub-topics related to its recent development and policy analyses in transition studies. Highly relevant information was also acquired from white papers, i.e., reports from the Norwegian Oil and Energy Department (OED) to the Norwegian Parliament. These white papers have especially contributed to this research, as they have high explanatory value of the political and administrative stance on policies for renewables and, more specifically, wind power throughout the past twenty years. However, my main method of gathering information has been through conducting semi-structured informant-based interviews.

There are two reasons for choosing interviews as one of the main methods for this thesis. Firstly, conducting interviews was done to investigate highly relevant actors' position and opinions within this topic. Secondly, the information I have gathered from the interviewing process has further guided my choice of which sub-topics to explore. The interview questions have been framed in ways that hopefully would allow the informants to provide a list of actors and information on how policies adapt and are formed, and how their participation has influenced the outcome of the wind power transition in Norway. Furthermore, one of my informants referred me to my next informant who I was told would be a relevant actor who would provide information which this paper would benefit from. As I was unsure what my informants would say, I settled for semi-structured interviewing to allow my informants to go into more detail in the information they provided. To safeguard my informants, I decided to keep them anonymous. Resorting to anonymous interviewing does not only assure my informants that there will be no consequences from any controversial statements, but the likelihood of them providing their most honest opinion, even on contentious matters, also increases because of their secure status as anonymous participants. The informants are more familiar with this topic than I was before, during, and probably after the writing of this thesis. Therefore, my judgement has been to trust their responses on which elements have had an impact on the transition of the Norwegian wind power industry as they are respected experts.

However, I have attempted to support this with the document analysis and usage of official white papers. In methodical terms, the research approach can be described as a literature review of peer reviewed research articles and document analyses, as well as qualitative data gathering through interviewing.

## 3.2 Selection of informants and literature

The purpose of doing interviews was to obtain information from informants who work with, or have a great academic or professional experience of topics related to wind power in Norway and energy- and climate policy. The selection of informants was chosen by the perception of their differing stance on wind power in Norway, as well as the impression that they would most likely have lots of valuable insights on the research question. Many relevant actors were contacted during the research process, but only a few replies were received. However, this was unsurprising due to the COVID-19 pandemic altering work-life balances, and the natural difficulty that unknown and young/early-stage researchers have when it comes to getting time with informants. Still, I would argue that I obtained an interview with one of the most important actors in Norwegian wind power development, The Norwegian Water Recourses and Energy Directorate (NVE). In addition to NVE, I managed to conduct an interview with an informant who is both an academic and a researcher, who themselves has conducted several studies on wind power development and related political processes in Norway. Also, as aforementioned, one of the informants was selected based on a reference from the previous informant. This was a representative from The Norwegian Association of Local and Regional Authorities (KS). This proved to be a good reference as this also provided me with excellent information that was highly relevant to my thesis topic.

# 4. The German Energy Transition Policies' Influence

## 4.1 Historical background of the "Energiewende" and the implementation of feed-in tariffs (FIT) for renewable energy sources (RES)

*Energiewende* is the German meaning for 'energy transition' and is known as Germany's ambitious energy policy for encouraging a phase out of coal and nuclear energy sources, replacing them with renewable energy sources (RES) (Fischer, Hake, Kuckshinrichs, Schröder & Venghaus, 2016: 1580; Strunz 2014: 150-151; Werner & Scholtens, 2016: 402). The transition has received attention globally for being perceived as a success. During the 1950s, a combination of various elements led Germany's political preference to shift towards nuclear energy and thus began subsidising energy companies willing to develop it (Hake, et al., 2015: 532, 534; Strunz, 2014: 154). The *Energiewende*, however, started in 1991, as the feed-in tariffs (FITs) for RES made its debut (Hitaj & Löschel, 2019: 19). After twenty years of a growing discourse to phase out nuclear energy in Germany (Hake, et al., 2015: 535-537; Dryzek, 2005: 208), the federal government responded in 2000 with the *nuclear phase-out* along with *Renewable Energy Sources Act* (EEG) (Hake, et al., 2015: 541; Strunz, 2014: 150). This act presented some adjustments of the FITs for RES (Bosch & Schmidt, 2020) More importantly, a change was made particularly for wind power on the amount of FIT subsidises that would be given. This would now be based on its location's windiness; those located in more wind-intensive locations would receive less than those with fewer wind resources (Hitaj & Löschel, 2019: 19; Gawel et al., 2016). The proposed policy of the EEG to phase out nuclear energy completely, was agreed upon in 2011, as political unrest echoed from the disastrous events of the Fukushima nuclear reactor (Hake, et al., 2015: 542). The political parties agreed upon a gradual phase out of all reactors within 2022. As the phase-out of nuclear was certain, the attractiveness to invest in RES developments increased (Strunz, 2014: 153-154).

## 4.2 The Energiewende's impact on wind power development

Germany's environmental policies have had a significant impact on the innovation of technology for RES development (Frondel, Horbach & Rennings, 2007: 156; Strunz, 2014: 152) including wind power technology (Hitaj & Löschel, 2019; del Río, 2011). Although previous research has shown that increases in FITs have had a negative correlation to investments in wind power in Germany, as policy changes, even beneficial ones, made investors uncertain (Werner & Scholtens, 2016: 406), German wind power has, generally, been rising. Only noticeable decreases of wind power installations can be seen in 2004 and 2009 due to EEGs policy changes (excluding 2008's global economic complications) (Hitaj & Löschel, 2019: 23). From 1991 to 2016, the production capacity from wind power rose from 100 MW to 46,000 MW (Hitaj & Löschel 2019: 18; Werner & Scholtens, 2016: 403-404). Additionally, Hitaj and Löschel's findings shows that per increase of 1€-cent/kWh in FIT to wind power led to an average yearly growth in capacity with 905 MW from 2000 to 2010. (Hitaj & Löschel, 2019: 20, 29). Interestingly, Germany's choice to reduce domestic FIT subsidises to facilities in more wind-intensive locations might have had the most significant impact on its technological advancements. This is due to the scheme's increased likelihood of stimulating demand in the market. Obviously, since more wind-intensive facilities receive less FITs, they would have an incentive to demand technological innovation and stimulate cost-reduction from turbine manufacturers to increase energy production and profits, which has shown to be true in Germany (del Río, 2011: 147). These findings, especially to cap subsidises to very wind rich facilities, are supported by Gawel et al.'s (2016) research, focusing Germany's technology-specific support scheme where their study show that Germany's choice to have variations in FITs between different energy sources, i.e., technology-specific support schemes for RES, have been found to have fuelled innovation for wind power (Gawel, Lehmann, Purkus, Söderholm & Witte, 2016). Furthermore, del Río's (2011) findings show that the main mechanism for technological advancements and cost-reductions is competitiveness in its market, which is more likely to grow where there is a greater diversity of actors. His findings complement the data illustrating the diverse range of wind power owners in Germany (Strunz, 2014: 152) and confirms this has indeed been the case (del Río, 2011: 147).

# 5. The Norwegian Policy on Wind Power Development

## 5.1 The political objectives and the evolution of Norwegian wind power

At the end of the 1990s the Norwegian Parliament discussed the future development of the energy sector. The ratification of the Kyoto-protocol, in December 1997 (FN, 2020), obliged countries to reduce greenhouse gas (GHG) emissions. For Norway, this meant not to increase GHG emissions by more than 1 percent in 2010 compared to 1990-levels, and a reduction of

20 percent by 2020 compared to 1990-levels. Norway could not continue relying on constructing and upgrading hydropower facilities, as The Ministry of Petroleum and Energy (OED) stressed that this possibility would soon be over as the government opposed developments which would intervene with the preservation of valuable environmental areas. However, they saw that other RES, such as wind power, had high power generating potential. The government desired to stimulate development of RES in the coming years. Most importantly, Norwegian authorities set an objective to reach a yearly electricity production of 3 TWh from wind power facilities by 2010. Interestingly, the government also wished to strengthen the roles of municipalities and counties in the spatial planning of electricity generating facilities (OED, 1999). The white paper of 2001, *St.meld. nr. 37: Om vasskrafta og kraftbalansen* [About the hydropower and energy-balance], highlighted the issues facing the security of energy supply, such as years with little rainfall and hardships to develop more hydropower without putting additional strain on the local environment, something the government wished to avoid. At this time, *The Norwegian Water Resources and Energy Directorate* (NVE), which is the central body in charge of license processing for power plants in Norway, had given licenses to five large developers to construct wind power facilities with an estimated combined capacity at 1,6 TWh. But as early as this time, complaints had already started flourishing on these grants, indicating conflicts with the environment and cultural-historical considerations (OED, 2001). Gulbrandsen et al.'s (2021) study uncovered, by looking at several letters, that OED requested NVE to accelerate its processing of licenses, i.e., wind power applications, in 2007. Similar letters followed in 2009, 2010, 2011 and 2012. The following years up until 2017, the letters did, however, not mention wind power (Gulbrandsen, 2021: 6-7). Reasons for this could indicate that the target to reach 3 TWh electricity production from wind energy seemed far off, which is complemented by the data of installed capacity from 2000-2010 (see Fig. 3) (NVE, 2021). Indeed, in 2010, Norway's electricity production generated from wind only reached approximately 1 TWh (Blindheim, 2013: 337).

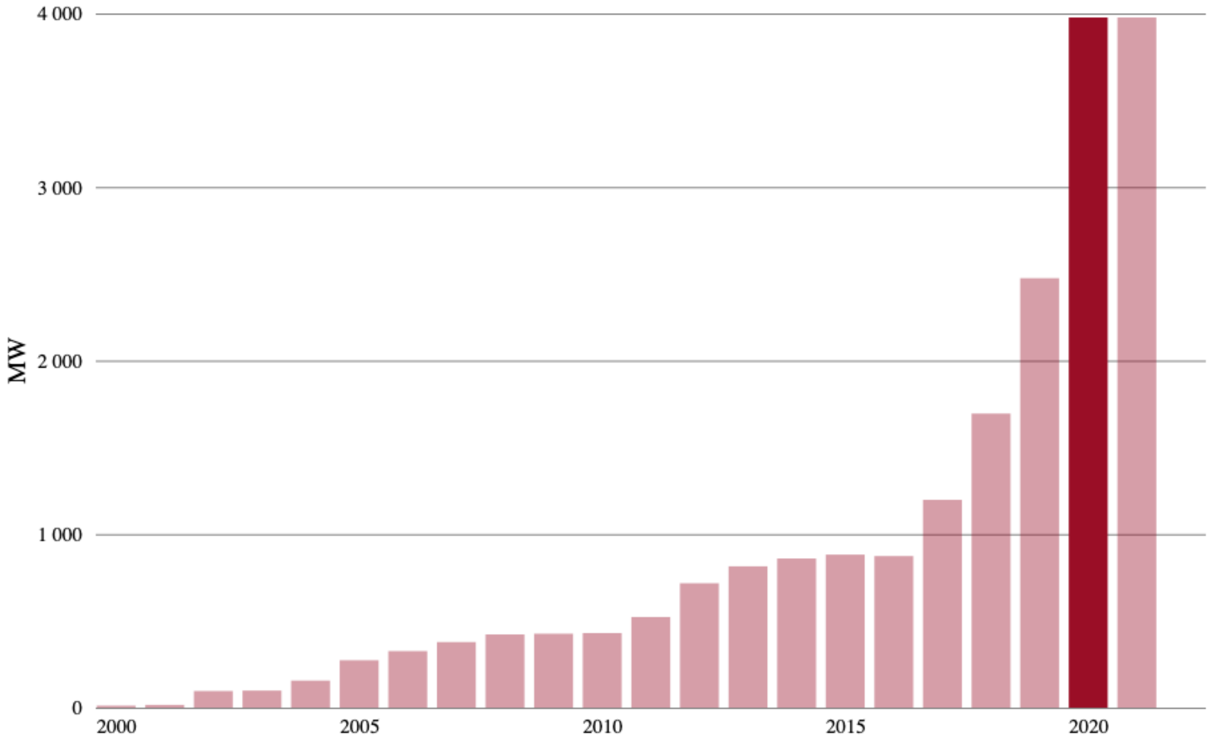


Fig. 3. Installed efficiency [MW] of wind power – aggregated per year 2000-2021. Source: NVE

## 5.2 Norway and Sweden’s common market for green certificates

During the two years prior to Norway’s 3 TWh objective, discussions on subsidising schemes to stimulate development of RES were on the political agenda. A subsidy known as green certificates[4] was a prospective solution of the discussions (OED, 2019). This scheme was created with Sweden. Due to the already existing Nordic electricity market partnership, Nordpool, the two countries agreed to extend their cooperation by implementing a bilateral common market for green certificates trading in 2011, which began functioning in 2012 (Blindheim, 2013: 340). In short, the scheme’s basic principle is that the owners of renewable energy resources (RES) receive one certificate per MWh they produce, which then can be traded to the energy consumers who are obliged by the governments to purchase these certificates in a specified quota, depending on their total energy consumption. The value of the green certificates will be determined by its supply and demand. The reason for cross-border cooperation in this market was justified to stimulate more rapid development of RES and aid these countries in reaching their targets. The two countries differ, however, in how they

[4] Also described as *el-certificates* by OED (2019).

distribute the certificates (Finjord, et al., 2018: 375). Norway would give certificates to facilities of RES for a period of 15 years. The deadline for receiving certificates was first a completion of the facilities by the 31st of December 2020, but in 2016, the government decided to extend the deadline to the same date of 2021 in case of license processing- and construction delays (Gulbrandsen, et al., 2021: 6).

Along with the implementation of the common certificate market came a target for the neighbouring countries to reach a combined installed RES capacity of 28,4 TWh by the end of 2020. Out of these, Norway would contribute with at least 13,2 TWh, equivalent to roughly 10 percent of Norway's total production by 2015 standards (OED, 2015: 197). Sweden's RES development target for 2020 was the remaining 15,2 TWh (Finjord, et al., 2018: 375), which meant that Sweden's supply of RES development would be higher than Norway's and would thus grant more certificates which would be available for purchase in both countries. However, the difference is due to Sweden's ambition to increase their goal with an additional 2 TWh in 2015 (OED, 2019: 12). This common certificate agreement was a response to the EU's Renewable Energy Directive Act of 2009 (Blindheim, 2015: 16), a directive that's purpose was to motivate member states (including EEA countries) to reduce GHG emissions, strengthen the security of the energy supply, and to promote technological innovation from RES (European Parliament, 2009). Here, Norway's promise was to commit to a minimum of 67.5 percent of total energy consumption coming from RES (Gulbrandsen et al., 2021: 9).

## 5.3 A shift in decision-making authority for wind power

In 2008, the Norwegian counties and municipalities lost their formal decision-making authority on the spatial planning for future power plants applications, including wind power facilities, due to a modification of the Plan- and Building Act (PBL). Up to this point, the local and regional authorities had overseen the land-use planning while NVE oversaw the remaining license, i.e., granting the right to produce electricity and to connect to the power grids. After this modification, the spatial planning authority was also granted to NVE, making the directorate under the OED the new formal decision-making authority in wind power license management (Saglie, Inderberg & Rognstad, 2020: 151). However, OED stressed that this did not mean that the procedures of the act no longer applied for wind power license processing

(OED, 2019: 26). Many license applications were approved in 2016 (OED, 2019: 5), and in the following year, OED requested NVE to create a national framework for onshore wind power in Norway. Two years later, NVE presented the proposed framework and it contained results from reports which accommodated greater knowledge of how wind power could influence environmental- and social interests alongside a mapping of suitable areas for future wind power development (NVE, 2019). However, when this was presented, the government decided to temporarily halt the processing of any future license applications (OED, 2019: 5) and proposed to reform the procedural framework for wind power applications (Gulbrandsen, et al., 2021: 10).

# 6. Findings

The first interview conducted in this research was done with an informant representing NVE's *Virkemidler og internasjonale rammer EV* [Instruments and International frameworks]. As stated in section 2, the results from the first interview changed the research approach for this thesis significantly. The questions were therefore designed to give data which would strengthen the hypothesis at that time[5]. Despite the change of theory and hypothesis[6], the findings from the first interview, before the change of approach, are still relevant. Thus, the second informant, the researcher, was given the same questions. Some of the data gathered from the informants vary as different sub-topics were revealed. The last interview with KS could just as well be categorised as an unstructured interview, as this informant did not have the same insights on the main topics in the list of questions.

The first question was if Norway's wind power policy had been influenced by the European Union, or other foreign stakeholders. Both the NVE representative and the researcher answered yes by referring to Norway's obligation to meet the EU's Renewable Energy Directive target for an RES consumption of 67,5 percent. They stated that the directive was somewhat arranged so that countries would be motivated to implement support schemes for the

[5] That was along the lines that multiple different actors with various backgrounds and goals came together to form coalitions that resulted in a policy which supported wind power development in Norway.
[6] That the development resulted through a combination of factors such as technological innovation, cost-reductions, and domestic- and non-domestic influences stimulating the political will to commit to developing targets of Norwegian wind power.

development of RES, such as implementing feed-in tariffs (FITs) or competitive markets for green certificates trading. Therefore, they agreed in line with my literature findings that the directive was an important driver for Norway to join with Sweden's support scheme for RES. It is also worth mentioning that energy consumers, i.e., citizens, would have to pay extra to cover the cost of the certificate grants, which explains some of the reasons why resistance to wind power has occurred. However, the implementation of the green certificate market was the sole example given of EU's influence over Norwegian wind power, and that it could only be regarded as an indirect influence. The researcher mentioned, as stated earlier, that there had been granted licenses for many developers prior to the implementation of the support scheme with Sweden, but few were motivated to start construction due to high costs. Sweden saw early increases in wind power development after January 2012, but the developers who were granted licenses in Norway, did not start construction immediately (OED, 2019: 13). However, a study found that Sweden would be the more profitable country to develop in early on, and in smaller investments in comparison to Norway, due to the difference in the certificate granting procedure. Norway, on the other hand, was more profitable to invest in large amounts at once (Finjord, et al., 2018: 379), which could explain the country's delay. Anyhow, the researcher stated that Sweden's wind power installations have led to further technology advancements and cost reductions which could have affected the following developments in Norway. The relative production costs of wind power fell roughly 40 percent from 2012 to 2019 (OED, 2019: 10). Ultimately, NVE experienced a boom, also referred to as a "Klondike-like" experience[7], of license applications. This led NVE to take extra measures to ease the stress by dismissing applications which they saw were standing no chance of being granted a license. The researcher stated that this practice was not really within the legal framework, but no one cared as it made the whole process much easier and less time consuming for most parties.

Another element which has been crucial for the wind power development in Norway is the accessibility for foreign financing. Wind power has been seen as a safe long-term investment which has attracted foreign pension funds (e.g., the city council of Munich and the Credit Suisse Energy Infrastructure Partners) (Øverbekk, et al., 2018). Furthermore, the possibility to make *Power Purchase Agreements* (PPAs) have ensured income for wind power

[7] A "Klondike-like" experience refers to the Klondike gold rush in northwest Canada in the late 19th century, where the discovery of gold in the Klondike region drew tens of thousands of migrants to the region to dig for gold. Nowadays, the term is often used to refer to an event where many actors are drawn towards reaching the same goal; to obtain wealth, at the same time.
For more information, see: https://www.nps.gov/klgo/learn/goldrush.htm

facilities. PPAs let foreign consumers purchase their power (on paper) for a set period. Both informants stated that foreign companies, such as Facebook and Google, have made PPAs with the wind power industry in Norway to support renewables and to obtain a green portfolio. All informants were asked which actors they saw had influenced wind power policy and development the most. Apart from the official sector, the non-governmental organisation NORWEA, who functions as a collective representative for energy companies who are developing wind power, was mentioned. Otherwise, companies such as Trønder Energi, Zephyr, Norsk Vind og Energi and Statkraft were given as examples. Unfortunately, as stated in this paper's introduction, none of these actors were available for interviewing for this thesis' research, despite all being contacted. However, according to the researcher, various companies, e.g., Statkraft, have stated that they will not continue developing wind power for now, due to the increasing controversy and citizen opposition on Norwegian wind power in general. NVE and the researcher expressed that the future of Norway's onshore wind power development is unclear for now as much depends on the outcome of the current political discussions. However, NVE has estimated, based on their current license application processing and projects that are under development, that there will be an increase of installed capacity of roughly 18 TWh within the end of 2022.

The last interview with the informant representing KS's department of transport planning, nature, and resource management, presented some issues that was a consequence of the PBL's policy change back in 2008. The informant also referred to a note (KS, 2021) and a report (Fauchald, 2018) which mapped some of the main difficulties for the local authorities with today's policy. Firstly, as mentioned, the consequence of the policy change in 2008 is that prospective wind power facilities which have received license to develop are no longer required for a regular spatial plan on the local level like other industries. Secondly, facilities for the transfer or conversion of energy can now be exempt from the PBL (Fauchald, 2018: 5-6). Furthermore, an organisation in opposition of wind power development in Norway, *Motvind Norge*, have added that this policy change, where the authority for spatial planning decisions is being merged with the license processing body which reside on the state level, i.e., NVE, has violated the legal frameworks (Sandøy, 2021). It is complicated, but in short this means that counties and municipalities have significantly less control over spatial planning procedures when it comes to wind power development. KS' note highlights that NVE's compiled proposals of suitable areas for wind power development should not have any legal consequences, but rather be used as a guide instead (KS, 2021). The informant continued by expressing that this was about decision-making processes. If those affected by the decisions are not included in the decisions, then it will not be anchored. The affected who is not included in this phrase is the local- and regional authorities. Although the government stated that by giving NVE the authority in decision-making processes of wind power would mitigate conflicts, the effect was the opposite. KS saw no good reason for this change and expressed that the local democracy was given a consultative position only. Although NVE has responded that they give licences where the positives outweigh the negatives, most citizens do not know which elements are weighed, and thus, a lack of transparency becomes a problem.

The informant further referred to instances where wind power facilities had undergone changes where the height and numbers of turbines had changed without a second decision-making process by local authorities. Instances like this has been made possible as specifications such as turbine size is part of the detail plan. This plan can be modified after a license is granted, without having to reprocess the license, if NVE deems that the new modifications will still comply within the impact assessments that was done prior to the licence granting (OED, 2019: 42). One example is Vardafjell Vindkraft AS in Sandnes municipality. Here, the license was granted in 2014 for a development of 9 turbines with a height of 126,5 meters, but in 2017, the detail plan was approved by NVE for a construction of 7 turbines with the height of 150 meters (Solheim, 2020: 1-2). There have also been complaints on the quality of impact assessments done prior to license processing, but KS stressed that this is not NVE's fault, as these are done by independent consultants on behalf of the developer. KS is neither criticising NVE's work, but they are against the decision-making power they have been given. The informant from KS then informed that, when this was voted for back in 2008, a representative with connections in the energy sector won the rest of the parliament votes with their good arguments for why the energy sector should be exempt the PBL. KS are now working on influencing the parliament in their favour (KS, 2021), as the future wind power policy has not been decided on yet.

# 7. Discussion – Applying the Findings to the Multi-Level Perspective

In the middle of section 2.2, I indicated that elements such as international relations, supranational governance, cross border co-operation, and natural resources should be included in the *socio-technical landscape* of the MLP. This is because I would argue that these are elements that political decision-makings bodies take into consideration when forming policies with the aim of stimulating certain transitions. The yet unpublished article by Silvester, et. al., (2021) argues that there is a “political landscape as a distinct dimension within the socio-technical landscape” (Silvester, Langhelle, Kern, Rosenbloom & Meadowcroft, 2021: 3), and that its influence traverse across all the other dimensions within the MLP (Silvester, et al., 2021). The elements I have mentioned are doubtfully oversteering politics but have a rather strong influence on the outcome of political decisions. I would argue that the ratifications such as the Kyoto-protocol, the Paris Agreement, and countries’ will to follow their obligations from EU’s Electricity Market Directive of 1997 and Renewable Energy Directive of 2009, along with Norway and Sweden’s common market for green certificates trading, are prime examples of agreements that have been influenced by international relations, supranational governance, cross border co-operation, and/or natural resources (i.e., change of accessibility of natural resources due to climate change). The political bodies we have looked at in this thesis, i.e., Germany and Norway, have stimulated certain transitions through forming policies, which in this case have been influenced by the global discourse and continental directives to decrease GHG emissions, phase out nuclear power, increase the percentage of energy consumption from RES, and stimulate its growth. However, as we have seen, their policies for stimulating the development of RES differ. A more in-depth comparison of these two types of schemes can be found in Rigel’s (2005) article. The focus here, however, is that Germany’s policy has stimulated more technological innovation, which has in turn impacted the ways of which wind power development would have occurred in Norway elsewise.

Firstly, I would argue that Germany’s history to phase out nuclear power, and replace these with RES, is the beginning of one dimension of the MLP influencing another. Here, the power of the political landscape altered the policies, which reside on the socio-technical regime, to phase out nuclear reactors, and replace these with RES. To nourish technological trajectories within the wind power sector, FITs were implemented, and later modified through the EEG in a clever way that would encourage facility owners to demand technological development and cost reductions from the developers themselves. Then, I would argue that the EU’s Renewable Directive is another element on the regime level as it is a result of the EU’s governance, from the political landscape above, and thus, lays expectations for new niches to enter its altered socio-technical regime. I would claim that the EU’s Renewable Directive is an example of a transition process where changes in the socio-technical landscape, e.g., climate change, pressures the regime to change its system, and thus have opened for niches to ‘take advantage of the window of opportunity' and develop solutions (Geels & Kemp, 2007; 446). This is also a clear example of the point that I made in section 2.2, that technology transitions not only depend on policies and the industry on the regime level, but also pressures from the landscape level can stimulate specific innovation. Countries tied to the EU, including EEA countries like Norway, could do their own thing, however, even if they are neglecting a part of a legally binding agreement, but most likely at the expense of receiving harsh responses and other unwanted consequences from others. My point here is, that Norway's will to follow its obligations was not really forced, even though the word 'directive' would literally indicate that it was. I argue that this classification is important when placing Norway as a body on the political landscape in the MLP, as it emphasises the country's autonomy from other countries and organisations' stances in political discussions. However, as indicated by earlier studies and my informants, the implementation of Norway and Sweden's certificate scheme highly correlates to the EU's Renewable Energy Directive of 2009. When Norway implemented the green certificates scheme with Sweden in 2012, the EU, and more importantly Germany, had already facilitated niches to develop technology in RES. As Finjord, et al.'s (2018) study indicated, the support schemes in Norway and Sweden differed, which led investors with smaller investment sums being more drawn towards investing and develop wind power in Sweden first. My informants argued that this would have further impacted the maturing of wind power technology, which has been used in Norway's wind power facilities in the following years. Thus, I would argue that the EU's Renewable Energy Directive has impacted Norway's political ambition to develop wind power, as an element on the political landscape since Norway decided to adapt to the influence that the regime, i.e., the EU's directive, posed on them. Furthermore, another political landscape, Germany, have most certainly also been influenced by this regime in various degrees. But in this thesis, I have mostly uncovered Germany's will to stimulate RES due to the change of discourse to phase out nuclear energy, which created policies that fuelled the innovation of wind power. My two informants who spoke on this subject agreed to this statement. Therefore, I argue that Germany's policy has fostered what Geels and Kemp (2007) called *technological niches*,[8] in the wind power sector. When Norway joined Sweden's green certificate market, I would argue that these niches had already made it to the socio-technical regime level, and thus, illustrates the second arrow I pointed at from Fig. 2. of the MLP in section 2.2.

[8] See section 2.2

Other elements such as a shortage of possible areas to build hydropower facilities without being able to mitigate negative impacts on the environment, are among the examples of *natural resources* I argued belonged to the socio-technical landscape, which have influenced Norway's policy for developing alternative RES. At this time of realisation, Norway mainly sought after wind power but not explicitly, to increase the security of supply of energy (OED, 1999). However, the Norwegian Parliament still set a goal for a yearly production of 3 TWh from wind within 2010. But it was not reached which Blindheim (2013) pointed out was due to a lack of political will and predictability, i.e., a lack of a robust wind power policy. I argue that the changes to the PBL in 2008 is an example of a sudden increase in political will to 'get it right', as the foreseeable future at that time did not look optimistic for the target to be reached. However, the changes made for the energy sector have had complications in the following years as my informant from KS indicated. This illustrates the consequence of Norway's stressed action to form a policy aimed at making quick results, but on the other hand decreased predictability and transparency for other stakeholders within the wind power sector. Furthermore, the body of authority in wind power decision, NVE, was not ready to handle the license applications that they received after the green certificate implementation, hence the "Klondike-like" experience. This, in my opinion, illustrates the power one political landscape has in influencing other political landscapes; by stimulating technological niches to enter the socio-technical regime, were multiple political landscapes, i.e., Germany and Norway (and other European countries), are connected to as a collective.

# 8. Conclusion

Norway's wind power policy is currently under re-evaluation in the Norwegian Parliament as a response to NVE's compiled proposals of suitable areas for wind power development. In this thesis, I have presented elements which have facilitated the transition of Norwegian wind power throughout the last twenty years. The findings from my research indicates that Norway's ambition to invest in wind power development mostly stems from itself since hydropower has increasingly become more difficult to develop without negatively impacting other areas. Interestingly, the findings indicate that the current halt in license grants for wind power development is due to a policy change which made NVE the sole authority of wind power decisions, despite the wish to strengthen the roles of the local authorities in the spatial planning of electricity generating facilities, as expressed by the government ten years earlier. This policy change seems to have been a reaction under political stress as Norway was not close in reaching its wind power goal by 2010. This change has been met with increasing resistance from the local and regional authorities, as expressed by the informant representing KS. Furthermore, my two other informants also indicated that the possibility for foreign capital to invest in Norwegian wind power has fuelled the development. But in which degree this has had an impact in comparison to other elements has not been explored in this thesis. However, Norway's wind power policy has been indirectly influenced by the EU in strengthening the political will to do something, which has led to the implementation of the green certificate scheme with Sweden with its objective to stimulate wind power growth. Furthermore, Germany have also undergone policy changes within the energy sector and have significantly fostered the technological growth of wind power, which in turn has affected the development of wind power in Norway. There may very well be other countries which have also strongly driven technological innovation in wind power, but Germany was chosen as the research subject of this thesis, along with Norway of course, based on the information I received from my interviews. It might be a little far stretched to state that there is a causal connection between Norway's wind power development with Germany's response to the Fukushima nuclear disaster in 2011. However, interestingly, this thesis has highlighted that there is a connection of influence between the two. Still, we cannot exclude the possibility that this connection is minimal. It is therefore worth mentioning that a potential weakness of this thesis is that there are so many elements that can be explored and that may have influenced the transition of Norwegian wind power outside of the ones focused on in this thesis. Other countries' policies for RES, and a dedicated review at public opinion, are two examples I would mention here. However, it is also important to confine the scope of the thesis, especially considering the time limits and limited word-count. In addition, it is unfavourable that many of the prospected and highly relevant informants, such as the influential stakeholders mentioned by my informants, did not wish to engage for interviewing. Their inclusion would undoubtfully contribute with additional explanatory value about the impacts on Norway's wind power policy and development. However, these possible shortcomings can point to other actors and elements that future research can look to explore. As stated in the introduction of this thesis, one of my aspirations was that this holistic approach to this topic can be of use to future research of wind power development, and its' policy, in Norway.

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[1] Representative from the licensing department of the Norwegian Water Resources and Energy Directorate (NVE)
[2] An academic and researcher with expert knowledge within this field, located at a prominent research think-tank in Norway that regularly works on wind power and with actors and stakeholders
[3] Representative from the Norwegian Association of Local and Regional Authorities (KS)

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