Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Social and Educational Sciences
Department of Sociology and Political Science

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What explains the recent focus on blue hydrogen in Norwegian politics?

Master's thesis in Lektor i Statsvitenskap
Supervisor: Espen Moe
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Abstract / Summary:

The purpose of the study is to take a deeper look into the reasons behind the push for blue hydrogen in Norway seen in recent years. The study attempts to establish if the support for blue hydrogen is a result of the vested interests of the industry, the state, or external pressure from the European Union on Norwegian energy policy. This study is a qualitative case-study that seeks to analyse the three perspectives based on the framework of vested interests.

Using a multi-level-perspective to map the key actors influencing the development of blue hydrogen in Norway, and their vested interests in the establishment of blue hydrogen as a key element in Norwegian energy politics in recent years. The study concludes that the actors have different reasons to pursue blue hydrogen, and that the establishment of blue hydrogen within Norwegian energy policy is a combination of different interests and influence from the analysed actors on the establishment of hydrogen policy. I have found that blue hydrogen becoming an important element in the Norwegian energy system, mainly is the result of the technology being advocated and presented as beneficial solution to issues specific to the different levels, and as a solution encompassing the combined vested interests of the industry, the state, and the European Union. The state has been influenced both from incumbents and the EU to invest in the project of blue hydrogen, and the perspective of the government is influenced by the markets ability to create value and the public opinion.

Sammendrag

Hensikten bak denne studien er å se nærmere på årsakene bak utviklingen i satsingen på blå hydrogen i Norge. Studien ønsker å se på om satsingen på blå hydrogen er et resultat av egeninteresser hos staten, industri eller eksternt press fra EU på norsk energipolitikk. Studien er en kvalitativ case-studie som tar utgangspunkt i å analysere de tre ulike perspektivene med utgangspunkt i Vested interests.

Ved bruk av et fler-nivå perspektiv for å kartlegge nøkkelaktørene som har påvirket utviklingen av blå hydrogen i Norge, og deres egeninteresser i å etablere blå hydrogen som et viktig element i norsk energipolitikk de seneste årene. Studien konkluderer med at de ulike aktørene har forskjellig grunnlag for å fremme blå hydrogen, og at etableringen av hydrogen innenfor norsk energipolitikk er en kombinasjon av ulike interesser og påvirkning fra de ulike analysenivåene på norsk hydrogenpolitikk. Jeg har funnet at blå hydrogen som en viktig del av norsk energipolitikk, i all hovedsak er et resultat av at teknologien har blitt presentert som en gunstig løsning på flere ulike løsninger for de ulike nivåene, og at løsningen samler de ulike egeninteressene til industrien, staten og EU under ett. Staten har blitt påvirket av både industri og EU for å satse på blå hydrogen, men statens satsing er også påvirket av troen på markedets evne til å skape verdi samt

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Any errors or faults are my own.

Eirin Østbø Juberg, Trondheim, June 2023.

Table of contents

Acronyms and abbreviations

CCS – carbon capture and storage

CO_2 – carbon dioxide

CO_2e – CO_2 equivalents.

EEA – European Economic Agreement

EU – European union

GHG – Greenhouse gas

H – Hydrogen

IEA – International Energy Agency

IPCC – Intergovernmental Panel on Climate Change

IPCEI – Important projects of common European interest

NDC – Nationally determined contributions

NGO – Non-governmental organisation

UNFCCC – United Nations Framework Convention on Climate Change

1. Introduction

The main contributor to climate change is the burning of fossil fuels, causing greenhouse gases previously stored in the form of hydrocarbons such as oil, coal and gas to be released into the atmosphere (Aklin & Urpelainen, 2018). Decades of human activity has caused a build-up of greenhouse gases in the atmosphere, allowing less heat to escape and the result is an alarming rise in global temperatures (IPCC, 2014). The obvious solution to the issue of climate change is to stop burning fossil fuels, and where the transition away from the current paradigm of fossil fuels have proven a slow and difficult challenge, renewables and alternative solutions are rapidly growing. Large parts of our society's need for energy can be fulfilled by scaling up production of renewable energy from wind and solar (UN, 2023). There are however sectors where it is harder to reduce emissions within the traditional routes of decarbonisation, such as direct electrification or improving energy efficiency (IEA, 2022b). Heavy-duty transportation and shipping are not easily connected to a fixed grid, and alongside chemical industries and production industries requiring high temperatures they are often recognised as both hard to decarbonise and major contributors to GHG emissions. A solution that has re-entered the spotlight as a potential solution to decarbonise these sectors, as well complementing the intermittent nature of renewables by serving as energy storage for the surplus energy produced on windy days, is argued by many to be found in Hydrogen.

Hydrogen has been a part of the discussions surrounding the energy system several times throughout the years. From Jules Vernes prophesy that *"water will one day be employed as a fuel"* in his book *The Mysterious Island* in 1874, the idea of hydrogen has regularly drawn attention and support between the publication of "The hydrogen Economy" in 1972 up to the present (Dillmann & Heinonen, 2023; Yap & Mc Lellan, 2023). The level of political and financial commitments in recent years, is however amounting to unprecedented levels of support (iea, 2019). The number of nations having established specific hydrogen strategies rising from only Japan in 2017, to 26 and growing in 2022(IEA, 2022), and hydrogen technology has been pushed to the front stage of the global energy sector. Because the luxury of time is no longer available in the fight against

climate change, it is essential that the technological solutions chosen to mitigate climate change are the "best" possible solutions, and hydrogen undoubtedly has potential. The technology is available and proven, yet no major technological innovations in recent years explain the renewed attention. The knowledge that even the best technology can fail if the social, economic, and geographical conditions necessary for a technology to succeed are missing (Berkhout et.al., 2003), could provide truth in the case of hydrogen. The costs of renewables have rapidly declined, and expectations are high that hydrogen technology will see a similar development, but it is not a given fact that hydrogen will be the future of energy. Some critics are concerned that the massive focus on hydrogen is only pushing the problem of emissions further into the future, as many nations are opting to support "low carbon" or "blue" hydrogen instead of carbon-free, "clean" hydrogen, also known as "green".

Among the nations currently advocating for hydrogen is the petroleum rich nation of Norway, where hydrogen technology is viewed as a key element in reducing emissions. It also promises a new industrial opportunity for the country, where exports of fossil fuel are a major part of the national economy. So why has hydrogen become the new hype in Norwegian energy politics? Is it an attempt to mitigate climate change, or is the "hydrogen hype" advocated by the actors benefiting from the current system or politicians seeking to win elections? A transitioning away from fossil fuels towards renewable and carbon-free energy solutions requires radical, structural changes. Understanding why some nations choose to invest in blue hydrogen where other nations are adamant in their support only extending to green hydrogen, is relevant to the larger picture of energy transition. Because it could help determine whether blue hydrogen is a sign of change, or as some critics are concerned an effort to prolong the use of fossil fuels allowing only incremental changes set by large carbon actors to influence the agenda instead of being the radical change the world urgently needs.

1.1. Research question

The goal of this study is to understand the reasons behind the Norwegian support towards blue hydrogen, by analysing the vested interests of the actors assumed to have influenced its current

position in Norwegian energy politics. I hope to attain this by answering the following research question:

Who is responsible for Norway's resent push for blue hydrogen, and is it a sign of an incremental or radical / structural change in the Norwegian energy landscape?

The study is a qualitative study, and the dependent variable being the push for blue hydrogen seen in recent years, and the independent variables thought to have affected its status are the vested interests of the industry, the state, and the European Union.

1.2 Case: Norway: blue hydrogen, a sign of change or a greenwashed fairy-tale?

In choosing to look at the case of Norway as a basis for this paper, it is possible to analyse the role of blue hydrogen in the energy transition from the view of a country with a large export oriented carbon-based sector and a complex relationship with fossil fuels. I argue that the question of why Norway has decided to support blue hydrogen is interesting because it could help in establishing if it is a sign of structural change, or incremental change.

By making use of the theoretical framework of vested interests in combination with literature on energy transition, I seek to gain knowledge and understanding of the interests and motivations able to explain why blue hydrogen has gained its current position in the Norwegian energy debate. I expect that the answer can be found either on the level of the state, the industry or at an external level, in this case the European union. The state has an inherent interest in energy, and as the Norwegian state is both a shareholder in major oil companies and benefits from taxation and regulations of the natural resources, looking at blue hydrogen from the perspective of understanding why the state is pushing this technology is relevant in seeking to understand the rising momentum of blue hydrogen in Norway. Where the oil and gas industry have an obvious

stake in the oil and gas industry, seeking to analyse their reasons for promoting a low-carbon solution could either be a legitimate push for green transition or, to make a play on Joseph Schumpeter's famous term "creative destruction", be a result of blue hydrogen creating innovation but without destroying their current venture, in other words creation without destruction. As a member of the European Economic area; Norwegian energy debates have been under pressure from both internal and external actors as its policy decisions is closely intertwined with the regulations of the European union, despite Norway not being a member state. The EU Renewable Energy Directive has had major effects on Norwegian renewable energy policy. This may be the case also with the EU third and subsequent fourth energy packages and with future renewable energy directives. It is very plausible that amongst all external actors influencing Norwegian energy policy, the EU is by far the most important. This relationship could entail that Norwegian focus on blue hydrogen is the result of adjusting to expected European regulations.

As time passes, the urgency to decarbonise is only increasing. An argument used by promoters of blue hydrogen is the obvious statement that the total amount of emissions we can eliminate from reaching our atmosphere now, are of utmost importance in preventing climate change and blue hydrogen is therefore a better alternative than continuing to burn fossil fuels until zero-emission alternatives are ready. Where green hydrogen has a long way to go before being able to supply current demand of hydrogen, this argument stands correct, but as Norway is embracing blue hydrogen it is poignant to understand if it is a half-hearted attempt of transition in other words "greenwashing" or if it is indeed investing in a green energy transition. When some of Norway's European neighbours solely support green hydrogen, and countries like India are voicing dedicated support and laying the grounds for large scale production of green hydrogen. The investments in blue hydrogen could either help Norway position itself aiding in transition, or prove its dependency on fossil fuels and confirm a situation of lock-in. Understanding why blue hydrogen has become important would therefore contribute valuable information on the way forward as well as giving insights into the reasons and motivations directing why it is happening.

1.3. Professional relevance

The relevance of the thesis as a part of the profession as a teacher is grounded in the main objectives of the Norwegian education system of promoting critical thinking, democracy, and developing awareness and insight into cultural diversity (Opplæringslova,1998). The critical view on the Norwegian petroleum industry encompasses the relevance and central values of social studies in the Norwegian education system, in enabling pupils to "recognize the connections between individual choices, societal structures and tolerance limits in nature" (Udir,2023) and "how geographic, historical and current events are the foundation from which people satisfy their needs, and how power and resources are distributed." (Udir, 2023). The topic of hydrogen and technological innovation, relates back to the actuality of climate change and the Norwegian government's view that higher education has an important role in the promotion of the UNs Sustainable Development Goals, in the professional practice of teaching (Meld.St. 4(2018-2019); *Meld. St. 40 (2020–2021)*).

1.4. The layout / contents of the paper/study

2. Theoretical approach

In this chapter, I will start by presenting the framework of vested interests and previous literature on hydrogen in the energy transition. Then I will present literature presenting the main reasons or explanations of the vested interests assumed to have been influential in the growth in blue hydrogen as it relates to the case of Norway. Why has blue hydrogen become such a major focus in Norway in such a short time? It is fairly easy to argue that there are at least three levels of analysis that can contribute to explaining this. The push for blue hydrogen can be found either within industry, the state or from external actors. Thus, I have chosen to organize the following according to the three aforementioned levels of analysis and highlighted different conceivable reasons to support blue hydrogen.

2.1 Vested interests in the energy transition

The use of vested interests as a theoretical framework in political science has grown from its value as an analytical tool in analysing and explaining behaviours and actions. The underlying notion of vested interests is that on an individual level, people will act according to their own self-interests and according to what they believe will benefit the vested interests they represent. With climate change putting the planet at imminent risk of detrimental harm, a theme underlying the growing research on energy transition is the idea that preserving the planet in the interests of future generations. As the vested interests of one individual combine with the vested interests of others, such as the survival of a company or access to healthcare and education, these vested interests grow more powerful and become more formalised as they represent larger groups. Institutions themselves are the result of vested interests, because the existence of vested interests are a prerequisite to the need of forming larger formalised groups aiming to protect and obtain benefits. Vested interests can therefore be seen both as the result of individual beliefs, shared interests held by a larger unit such as a company, and as inherent in the institutions created to act as larger entities of vested interests securing benefits for the individual and society in large.

When the vested interests of the global population and future generations to inherit a planet able to support life has been able to overthrow the narrative created by incumbents in the past, denying the negative effects of fossil fuels to protect their own interests and relieving themselves of responsibilities (Supran & Oreskes, 2021), it points towards a change in beliefs. Although not necessarily as being a change in the vested interests or the beliefs held by these companies (Elton, 2022; McGreal, 2021), it highlights how the vested interests of one actor might not be beneficial to others or society in large. In the case of hydrogen and the many unsuccessful attempts of creating a hydrogen economy there was a lack of a shared vision amongst the actors seeking to create it (McDowall & Eames, 2006). The current hype encompasses a broader spectrum of actors and technological solutions, but there are still clear differences in what different actors interpret as the beneficial aspects behind their stance in promoting hydrogen (Yap & Mc Lellan, 2023).

These different interpretations and expectations mostly overlap, and thereby acts as a shared concept in creating a common interest for the different actors (Yap & Mc Lellan, 2023).

A relatively new aspect of the current hydrogen hype is the production methods utilising fossil fuels combined with carbon capture and storage (CCS) technologies, in theory enabling the use of fossil fuels whilst at the same time promising to avoid the release of GHG emissions .

Literature seeking to analyse blue hydrogen and hydrogen in Norway has already sought to analyse the financial prospects and investments needed. There is also a broad consensus both in public documents, reports and the literature underlining the importance of regulatory support and financial incentives at the level of the state in contributing to establish a hydrogen value chain (Regjeringen, 2020; European commission, 2020). Where this research is important both to investors and governing organs, it does not go into detail to go into the *why* blue hydrogen became an important focus within Norwegian energy politics in the first place. With the unmatched international support towards hydrogen, establishing the interests and actors pushing blue hydrogen in a country with a carbon-based economy and questioning why it is happening can support the literature in understanding the reasons why some technologies gain traction and other not. As a society it is in our best interests that the research and investments made to mitigate climate change is invested wisely. When vested interests have played an important role in the politics surrounding swings in Norwegian wind-power installations (Moe, 2015), it is therefore interesting to study the phenomenon in other areas of Norwegian energy politics.

As blue hydrogen is a product derived from natural gas, looking at the vested interests of different actors and why they might seek to push for blue hydrogen has happened can help analyse if blue hydrogen as a “clean” energy solution is a sign of radical change to mitigate climate change or if it is an attempt to “greenwash” natural gas. Although there have been made attempts to create distance between domestic carbon actors and the institutions created around them, as vested interests, the institutions themselves would tend to work against major change to protect their own survival. Given that these institutions in Norway in part were created around oil, they would inevitably need to change if fossil fuels were banned it could be seen as a threat to the institutions

themselves. Seeking to answer the research question by only looking at incumbents such as Equinor or the state would ignore the close ties between the vested interests of the parties and the different goals these two actors might have. As a large exporter of fossil fuels, Norwegian energy politics is however not exempt from the possibility of vested interests at an external level seeking to influence Norwegian energy politics. Analysing the hype by utilising three levels of analysis, separating the industry, state and external pressure as different entities enables a better understanding of the possibility of combined vested interests as a factor in the push for blue hydrogen. It also factors in the understanding within literature on energy transition that a system based on intermittent energy sources requires closer international cooperation to ensure a stable supply energy, and how domestic energy politics can become subject to external pressures.

2.2. Industry

Incumbents, as in the large carbon actors currently dominating the energy system, has established themselves as strong vested interests in the energy sector. The access to energy is well established as essential to economic growth and development, and in controlling the energy market these incumbents have obtained a position of power and influence in society. Mildenberger argues that in corporative states, this has allowed incumbents to obtain access to politicians and always be granted a seat at the table on the inside of policy discussions relating to energy issues (Mildenberger, 2020). Some of the main supporters of blue hydrogen can be found within the

incumbents, but does that mean that these incumbents want to step away from fossil fuels and support a green energy transition as active participants in change, or is it the result of these actors vested interests seeking to secure profits and continue benefiting from the current paradigm?

Heavily invested in the current paradigm of fossil fuels, incumbents have clear incentives to secure the assets they have tied up in their carbon-based core operations, and they have obtained a reputation within the literature of being resistant to change (e.g., Moe, 2015). Where their involvement in the policy making process have been found to make change easier to obtain, their tendency of resisting change sees to it that even in situations where they are pressured or forced to accept change, a goal of preventing unfavourable effects to their existing business model and core operations leads to incremental rather than radical change (Aklin & Urpelainen, 2018; Mildenberger, 2020; Moe, 2015). As publicly traded companies they have an obligation to their owners to maximise shareholder value, in other words; they have an inherent interest in maintaining the profitable status quo and avoiding changes that could harm their operations and earnings potential. Increased pressure to reduce emissions, could however force changes in the market conditions under which the incumbents operate and therefore create the need to diversity their assets.

Where blue hydrogen is promised to be a “clean” energy solution, it is still a carbon-based product made from natural gas requiring expertise knowledge and the use of fossil fuels. In addition, the carbon capture and storage technology used in the process utilises the infrastructure already owned by the incumbents. This could be argued as a circumstance where incumbents would take on an active role to create change to allow for diversification and decarbonisation without abandoning their core operations. Kelsey (2018) categorised incumbent actors into four categories based on their approaches to change, arguing that change always results in the two categories of winners and losers easily defined as some actors inevitably loose benefits and others gain benefits because of any change. In viewing that some actors fall outside of these categories, Kelsey introduces the additional categories of “convertibles” and “management” to explain the circumstances and ways some actors opt for change rather than trying to maintain the stability

of the existing system. The management category in large consists of industries not directly affected by regulations on pollution. The “convertibles“ on the other hand consist of actors currently invested in products causing pollution, but who see the possibility of developing and adapting to non-polluting options. Kelsey argues that convertibles can utilise their competitive advantage in using their existing revenue streams, knowledge, and network from their carbon-based operations to enter new areas of operation (Kelsey, 2018). Looking specifically at Equinor being largest domestic carbon actor in Norway, their core operations and assets are tied to carbon-based projects. If looking for ways to diversifying their assets, seeking ways in which it is possible for them to utilise their current knowledge and expertise in handling natural gas makes blue hydrogen a relatively safe niche to explore and put themselves in a position as a convertible. With first mover advantages of entering a fairly new and unestablished market, the incumbents have the advantage against newcomers being backed up by revenue from the core operations and influence on policy decisions. Many technological solutions demand a global demand to see the costs attributed to the implementation of the technology to reach an acceptable level (Moe, 2015). Blue hydrogen could see incumbents act as an enabler of change, using their power to actively transform every system using their established benefits to support the creation of a hydrogen value chain.

A different take on incumbents and change focuses on how in certain situations, embracing change creates opportunities to gain competitive advantages that benefit the incumbents (Moe et al., 2021; Vormedal et al., 2020). An example of such an advantage was presented in a study looking at the vocal support from incumbents towards the implementation of moderate taxation on carbon emissions (Vormedal et al., 2020). The result of the moderate taxation on carbon created policy that favoured natural gas over coal, and thereby benefiting the large oil and gas companies. By supporting a moderate carbon tax, it indirectly helps incumbents secure the position of natural gas as the preferred base-load partner of intermittent renewables, affecting the competitiveness of their growing stake in natural gas and ensuring incremental change requiring less adaptation than more radical policy. In relation to blue hydrogen this also transfers to the CCS technology needed to remove emissions, and how tax credits such as the 45Q included

in the inflation reduction bill in the USA sees companies utilising CCS in production obtain subsidies for each ton CO_2e not released (IEA, 2023). In addition, the bill provides ever larger subsidies obtained when CO_2e is captured from the air (IEA, 2023). Incumbents supporting hydrogen can therefore be seen in line with preventing radical change, maintaining their ability to use and produce products within the current energy system and using incremental charges to further benefit from incentives aiming to mitigate climate change by securing profits to their specific expertise(Halper, 2023).

In summary, we can identify two obvious reasons why incumbents push for blue hydrogen: they might advocate hydrogen as a way of pre-empting the political authorities, pitching themselves as a decarbonising, convertible industry, thereby forestalling any attempts by the state to impose more radical change on the industry radical change. Or, they may advocate hydrogen as a way of acknowledging and supporting a shift towards low-carbon solutions to gain a competitive advantage over their competitors.

2.3. State

A large part of the literature on the politics of energy transition focuses on the level of the state, and how the state deals with incumbents and the systemic barriers of the techno-institutional complex (TICs) of the “carbon lock-in“ (Unruh,2000; Aklin & Urpelainen, 2018). The concept of a “carbon lock-in“ is defined by Gregory Unruh (2000) and used to describe how society is locked to the paradigm of fossil fuel technology. He argues that a path-dependent evolution focused on

increased returns resulted in the cheap fossil fuels outcompeting alternative technologies. Over time this resulted in systemic barriers being established throughout the technological, institutional, social and organizational levels of society, creating resistance to change as the lock-in became a part of societal norms and values (Unruh, 2000). A “carbon lock-in” constrains the actions available to policy makers, because unless politicians can influence the public opinion of the citizens to believe and understand the scientific evidence. Change will be limited to either the existence of cost-competitive alternatives able to evolve within the TICs before the damage to the climate is irreversible or, by waiting for climate change to reach “crisis” levels before policy action is possible (Unruh, 2002).

An alternative escape out of “carbon lock-in” to give renewables a fighting chance, is argued as governments taking advantage of a massive external shock (Aklin & Urpelainen, 2018). An external shock is defined as a major abrupt event occurring outside of the scope of the government's own policy that reveals weaknesses and issues with the current system. The shock forcing people to question the dominating position of fossil fuels and by facilitating a major shift in people's beliefs and values, paving the ground for radical change (Aklin & Urpelainen, 2018). Aklin and Urpelainen states that major shocks often result in temporary and incremental change as things tend to return to the previous norm after a short time (Aklin & Urpelainen,2018). To prevent this, governments can take advantage of temporary shifts to implement policy to enable radical and permanent change. Their argument resting on the notion that renewables are unable to break carbon lock-in without the help of government support, because the negative externalities of air pollution and GHG emissions are not reflected in energy prices and therefore fall outside the mechanisms of what the market conditions are able to regulate (Aklin & Urpelainen, 2018; Mazzucato, 2013).

Analysing the support of blue hydrogen from the perspective of how the state handles incumbents, places the state as a passive actor with limited ability to push for change because its institutions at their core are locked into fossil fuels and influenced by the incumbents (Moe, 2009b; 2015, Mildenberger, 2020). This in turn would see the state supporting any technological development such as blue hydrogen, as being the result of the state as passive and unable to resist the vested interests of incumbents. Where Norway has often worked to portray an image

of the Norwegian petroleum industry as “better” and more sustainable than other petroleum rich countries, previous literature points towards a significant link between a large domestic petroleum industry and national policy supporting fossil-based solutions, such as Norway’s CCS projects as a climate solution (Røttereng, 2018a).

Previous literature points towards how policy actions with the potential to massively reduce emissions tend to both be costly actions to take and require radical charge (Unruh, 2000; Moe, 2007). This means that policy makers as in elected government officials need to consider both the political and economic consequences of the solutions they chose to implement. The short-term risks of negative impact on national economy and their own popularity amongst voters can therefore in itself make it hard to implement policy intending to mitigate the long-term consequences of climate change(Unruh, 2002). Andrew Patt’s (2015) observation of “clumsy solutions” as a key element in successful energy policy, can however see the state as an agent of change by actively seeking policy solutions that unite different issue areas (Patt, 2015). Patt states that a core issue standing in the way of finding solutions, is that if everyone involved wants different things it is hard to find any common ground or solution. If however a solution has the potential to combine several issue areas and therefore be a solution acceptable for larger groups of vested interests, then this combination of different problems can make it easier to gain support for a policy. As Mildenberger argues that large carbon actors are always on the inside of the policy making process on climate and energy issues (Mildenberger, 2020). This allows the state room to maneuver the tendency of incumbents to resist policy that goes directly against their wishes, but it also makes it easier to gain obtain support for policy solutions because these actors are invited to contribute. The combination of different issue areas thereby creates openings for policy to be agreed upon, even if the solutions can fit a description of “clumsy” as some aspects are included to encompass the vested interests of several actors whom in general can see the policy as a solution to very different things. The push for hydrogen as a “clumsy solutions“, could enable the state to establish mitigation efforts, without making the incumbents included in the policy making process resist the change because it is an acceptable solution

In summary, it could easily be the state pushing for hydrogen. Here, as well, it is possible to identify at least two basic explanations. First, the state might fall victim to vested interest pressure and as a result end up supporting the initiatives of major incumbents. Or; the state might be an active agent itself, pursuing hydrogen as a solution with the ability of serving several purposes at the same time, as a solution that is a politically good fit for many different issue-areas.

2.4. External pressures – EU

Finally, with Norway being closely integrated with the EU, it cannot be taken for granted that Norway is the only, or even the dominant, actor when it comes to shaping Norwegian energy policies. This has led to a strong and arguably growing strand of thought within Norway suggesting that the most important energy policy decisions in Norway are actually taken by external actors, first and foremost the EU (Hansen & Moe, 2022).

The Norwegian energy supply and its potential for growth in renewables and low-carbon solutions has drawn the interest of actors outside the domestic sphere, a tendency present in the recent push directed towards hydrogen. Within the literature there are several studies pointing to external pressure having been exerted on Norwegian energy policy, with clear aims to influence and direct the decisions taken. When the Norwegian oil and gas market was substantially reorganized in the early 2000, this was partly a result of pressure from the EU for Norway to comply with EU competition law and adapt to the EUs gas directive (Moses & Letnes, 2017). Around 2010 the idea of Norway serving as a "green battery" to the European continent was an idea highly influenced by international relations and saw German Chancellor Angela Merkel personally involved in securing an agreement regarding the construction of subsea cables between Norway and Germany (Moe, E. Hansen, S. & Kjær, E, 2021). The term rapidly became a familiar concept in Norwegian energy politics and then prime minister Jens Stoltenberg was amongst the vocal supporters of Norway utilising its potential and serving as a battery to its European neighbours.

Thus, there is an expressed fear amongst prominent decisionmakers in Norway that the European union has obtained too much power over Norwegian energy politics, and that it is in the interest of the nation and its inhabitants to retain sovereignty over the domestic energy policy and energy resources (e.g., Hansen & Moe, 2022). The current minister of Finance, Trygve Slagsvold Vedum, representing the Center Party (SP) was for instance strongly opposed to the implementation of ACER and the EU's third Energy package, alongside large groups of individual citizens united in the view of European influence as a direct threat to Norwegian Sovereignty (Takvam, 2018; Hauso et al., 2018), Vedum recently stating that the Center party will never allow the EUs Fourth Energy Package to pass through the Norwegian Parliament (Svendsen, 2023).

The Norwegian membership in the European Economic Area means that through the EEA Agreement continuously being updated and amended to incorporate new internal market legislation, these amendments are implemented into the Norwegian legislation (Fermann, 2013; Moses & Letnes, 2017). The Norwegian green certificate system was triggered in part by the EUs Renewable Energy Directive (Hansen & Moe, 2022). Thus, EU directives have already been quite influential on Norwegian energy policies, even though Norway is not represented in the governing organs of the EU (Fermann, 2013). The EU's ambitious plans to decarbonize the European economy is one indication that this might also be the case in the future. The strong push for hydrogen in the European Green Deal is a concrete reason to suspect EU influence also on Norwegian Hydrogen Policy. While Norwegian energy recourses are supposed to be held outside the EEA agreement, the European commission's plans to end long-term gas contracts after 2049, could have clear implications on Norwegian plans for blue hydrogen and investments in hydrogen infrastructure. Though it remains to be seen how this will affect the prospects of Norwegian gas exports and blue hydrogen on a long-term basis, it potentially leaves natural gas as a Norwegian stranded asset vs. the EU, but where blue hydrogen provides a conceivable loophole, in the sense that exports of hydrogen – produced by natural gas – might still offer an outlet for Norwegian natural gas production (Cheng, 2023). It constitutes a significant incentive from the EU for Norway to find alternative uses of natural gas and to advance its strategy on hydrogen.

There are several precedents of the EU putting pressure on Norwegian Energy politics, and with the EUs ambitious plans to decarbonise the European economy, the Norwegian energy sector could play an essential part in the plans. As a result, it is possible to see the EU attempting to influence Norwegian energy policy to benefit from investments in Norway. Or, as the EU having to much power over Norwegian energy policy, influencing the decisions made.

4. Methodology

This study seeks to establish an understanding of why blue hydrogen technology has seen unprecedented support by analysing the data through the theoretical framework of vested interests. The main fallacy to any such project is the complexity and scale of the area being studied. In this case the global energy system consisting of a multitude of factors and actors invested in the subject matter. The ability to establish the boundaries within the study and choosing methods allowing the project to establish a limited objective and scaling down the reach to a smaller and specific area that still obtains the ability to provide valuable information to the area as a whole.

I have chosen to approach this by choosing to use a case-study as a research strategy as it provides a basis to understand one specific phenomenon, and aids in creating a more obtainable size for a project of this size.

The complexity brought on by multiple actors benefitting and having vested interests in the energy sector, is tackled by limiting the study to the main actors assumed to influence the area and therefore establishing the three levels of analysis used as a consistent lead through the paper.

4.1. Interviews, and the interview process.

Most of the data relating to the aim of the project is available within official documents, previous literature, and the public debate. Based on the increased momentum of hydrogen in recent years, the availability of the specific developments in hydrogen technology and recent changes in the prospects of the technology as an investment from the industry perspective was however limited. This created the need to gather additional information on the perspective, and I therefore chose to conduct interviews as a part of the study. The main issue when conducting interviews, the balance of asking questions that capture the relevant information whilst maintaining objectivity and inserting biases. Seeing that I was set on conducting a limited number of interviews and sought to obtain information that was not necessarily available through the public documents. I

felt that using a semi-structured interview based on the general themes, would allow me to balance the aim of obtaining both specific answers and more general information in the data collection. An advantage of using semi structured interviews is that it is called specific and enables access to the informants' thoughts, experiences, and knowledge (Moses & Knutsen, 2012). There is however the challenge that both the answers the questions and the responses might be covered by bias (Moses & Knutsen, 2012). The partially open structure within the interviews, allowed a more natural conversation in a less formal setting and enabled the informants to include additional information relating to the different themes.

In the process of recruiting informants, I used my personal network and sought to find informants specifically involved in hydrogen from the industry perspective. I was able to conduct interviews with two informants who are a part of Equinor's low-carbon solutions. Both informants came from a background in the more traditional petroleum industry but are now involved in the company's investments and development of low carbon solutions, including low-carbon hydrogen and CCS.

The informants were given notice of their rights as participants and the purpose of the study as part of the recruitment material, as well as a short recap and consent to audio recordings being conducted at the start of the interview session. The informants were informed that they would be presented anonymously but referencing their organisation and approximate status in the organisation. The informants wanted to approve any quotes used in the finished project before submission to avoid potential conflicts in the case that quotes could be taken out of context by third parties.

The interviews were conducted as digital video conferences/meeting through Microsoft's teams, as this enabled the interviews to be conducted as effectively as possible for both parties. To ensure the quality of the data, the audio was recorded, and the audio recordings later transcribed.

In addition to the general findings, I found that the informants in general saw the combination of hydrogen and political science as an interesting combination, pointing out that cooperation

between the industry and the policy makers is essential to finding solutions to policy regarding the energy transition.

4.2 Document analysis

Document analysis as a qualitative tool wherein documents are systematically reviewed with the aim of finding relevant information pertaining to the subject studied. The relevant parts of the contents being systematically registered in a way relevant for use as data.

The study required me to find data on several different areas. The technical aspects of hydrogen technology were a starting point, as I sought to obtain knowledge of the possible advantages and disadvantages of the technology as a basis to examine the political aspects, and to attain if technological development was the main reason behind the current support towards blue hydrogen. The basic understanding of the technology proved valuable later, in dismissing studies where the findings did not consider the technological boundaries or possibilities. The research also required general knowledge on energy transition and as I had decided to analyse how the vested interests of different actors influenced the push for blue hydrogen in Norway, I needed to seek out literature on the different actors.

In the study I have used different types of written documents, from both in official and unofficial form. Examples of official form is government documents, books, scientific papers and official rapports. Amongst unofficial sources are newspaper articles, internal documents surrendered by informants and other sources found on the Internet.

I have actively searched for the relevant official government documents both on the national and European level. In finding relevant literature to the theoretical perspectives, I have been given valuable recommendations from my supervisor. To find relevant research papers I have utilised scientific databases using my student access, and utilised keywords to find specific research. In addition to this I have also made use of the “snowball” method, where I have been able to use

the previous literature as a guide to find relevant information based on previous research done in the field.

In the case of quotes in other languages than the written language used in the paper they have been translated into English with the aim of making the full content and context of the study accessible to readers.

4.4 Case study

In choosing the topic for this project as energy politics, and more specifically looking at the renewed and unprecedented interest in hydrogen seen in recent years. It was evident that the complexity of the energy system and hydrogens position within the global context would be an incredibly large and complex project, far beyond the limits of a project of this size. It was also clear that Norway stood out as an early advocate for blue hydrogen, even though the Norwegian hydropower capacity in large enabled the country to avoid one of the main arguments used in support of hydrogen on the international agenda, the energy carrier's capacity of storing energy.

The main advantage of using case studies as a basis for research, is that it enables research into the complexity found within one specific phenomena (Moses & Knutsen, 2012). In this case, the phenomena of Norway's hydrogen policy and attempting to seek the origin of the support and interest in blue hydrogen within the country. Where there could be several reasons why the state itself would act as an active promoter of hydrogen, but the connection between the Norwegian hydrogen strategy being presented after the European union's own hydrogen strategy and "green deal" made it clear that there could be several interests influencing the decision to support blue hydrogen. This creating the possible case of attempting to explain the vested interests in Norwegian hydrogen, enabling an understanding of who has shaped the recent developments in Norwegian hydrogen policy. An objective within a case study is to enter into the research with an open mind, or at least as open as possible. This to obtain the complexity of the specific case, and thereby strengthening the internal validation of the study. Where several possible actors could

easily be argued as vested interests in Norwegian energy policy, it was not a clear understanding within the literature as to who had shaped the recent focus on blue hydrogen. The case study enabled me to gather data from several different sources and utilise empirical research to analyse and discuss the complex relationships within Norway's supportive stance on hydrogen and "low-carbon" hydrogen produced from fossil fuels.

A characteristic of a case study is its flexible design, making it possible to adjust the research question and the methods for obtaining data. This enables the systematic gathering and analysis of detailed information on specific cases (Moses & Knutsen, 2012). Because the nature of the case study relies on understanding the complexity and specifics relating to one single case or phenomenon, their value in creating standardised and generalised answers on a large scale is limited. The specific case is however distanced from a generalised dimension as they rely heavily on theoretical perspectives and therefore seeks to apply to a generalised understanding. This study is looking at the specific case of vested interests influencing the push for hydrogen in one specific country, but it translates to the literature on utilising established theoretical frameworks and builds on existing theory and can further the understanding of the vested interests of actors seeking to influence energy policy and the reasons why(Moses & Knutsen, 2012).

4.5 Validity and reliability.

Methods used in scientific research always bring challenges of the reliability and validity of the work (King, Keohane & Verba, 2021). Additionally, the reliability of the study is reduced by my subjective experience and knowledge, seeing that both the interviews and the analysis of documents are influenced by these factors as objectivity is an unobtainable ideal as we are all affected by our lived experiences.

Reliability refers to the data material gathered, and it the data used in the study can be identically replicated by others when using the same methods. By choosing interviews as a method of data gathering, replicating the exact same conditions, and getting identical data is close to impossible (King, Keohane & Verba, 2021). As the information gathered through interviews are nonetheless

important in obtaining nuances and information to the area of study, I maintain that the value gained from interviews is essential. This variation within qualitative research in using interviews, are mainly considered to be caused by variations in the design of the study, not undermining the value or reliability of the method (King, Keohane & Verba, 2021).

Validity pertains to whether the data gathered is valid to answer the questions the study seeks to understand, and points to whether the methods used are suitable (King, Keohane & Verba, 2021). In reviewing other studies closely related to the subject of the thesis, one main concern I found within many of the studies I reviewed was a lack of a basic technical understanding of hydrogen as the subject studied. Even though the methods utilised was relevant to the origin field of study, the lack of understanding and knowledge of hydrogen as an energy carrier created situations of the research providing problematic results, because it failed to consider basic practical and technical aspects, risks and limits inherent / characteristic to the technology that interfered with the validity of the analysis and the conclusions. Disregarding the importance and implications of technological understanding as an aspect of this study, even though not directly related to the field of political science, would therefore provide a problem of validity. In the worst-case scenario, leaving the project unable to provide any new insights and building knowledge on the field. This often created a bias as critical aspects of the technology at the core of the study were overlooked.

In my work with this study, I have sought to counteract this problem by obtaining at least a general understanding of hydrogen, its utility and the advantages / benefits and disadvantages of the technology in relation to energy transition. Furthermore, the text and my understanding of the technology has been revised for clarity and accuracy for the relevant paragraphs.

5. Empirical evidence

This chapter starts with a brief overview on hydrogen technology providing a base understanding of the technology and its growing momentum in recent years. The chapter will then go into the three different levels of analysis, presenting the industry, the Norwegian state and the European union.

5.1. Hydrogen

Hydrogen(H_2) is the most abundant, lightest, and smallest building block of our universe. The hydrogen molecules' atomic nature makes it reactive, in the form that when in contact with other components, such as the oxygen in our atmosphere, they bond together into larger components such as water (H_2O). Because of this reactivity, hydrogen is not readily available as pure gas on the planet, but it is found in abundance as an energy carrier within larger components. Hydrogen can be extracted from different sources, but the current hydrogen production is mainly based on natural gas, accounting for 47% of global production in 2021 and other fossil fuels (IRENA, 2023). Hydrogen produced with the use of electricity made up 4% of the global production in 2021, and only 1% from renewable origins (IRENA, 2023). The different production methods and sources that can be used, allows for production in countries who does not have large domestic fossil fuel deposits, marking it as a solution available to countries who today are dependent on energy imports (IEA, 2019).

The main use of hydrogen today is as a feedstock in chemical industry and refineries, steel production, and in heat and power generation. In recent years, the European Union has been a strong advocate for the utilisation of hydrogen in new sectors, specifically pointing towards implementing hydrogen in transportation and shipping as large emitters of GHGs that are hard to electrify using traditional routes. Where hydrogen itself is an odour- and colourless gas, a rainbow of colour variations has become regular vocabulary to differentiate the different means of production. The use of "Blue hydrogen" was first utilised by French gas company AirLiquide in 2015 to promote their internal vision of gradually decarbonising their hydrogen production with

carbon capture and storage (CCS) technology (AirLiquide, 2015). Then through the EU project CertifHy, as a proposal in the development of an origin scheme for hydrogen, differentiating between 100% renewable hydrogen(green), low-carbon hydrogen (blue) and grey hydrogen (Barth, 2016). Blue hydrogen is today synonymous with hydrogen from natural gas with CCS, a development strongly advocated by the Hydrogen Council established in 2017 (Foreign press association, 2021). The origins of the hydrogen might have implications to transportation and storage based on residual particles found in the final product (Seehusen, 2020), but the colours mainly serve to differentiate the production methods as a part of origin schemes and possibly as a marketing tool (Foreign press association, 2021).

5.1.1 Different production methods for hydrogen

Table: 1.1. Different production methods for hydrogen

Colour	Origin	Process
Grey hydrogen	Natural gas	Steam methane reforming (SMR)
Brown/black hydrogen	Brown/black Coal	Coal gasification
Green hydrogen	Renewable sources	Electrolysis of water using renewable electricity
Blue hydrogen	Natural gas	Steam gas reforming (SMR) with carbon capture and storage (CCS).
Pink hydrogen	Nuclear energy	High temperature electrolysis using nuclear energy

5.1.2. Equinor and (blue) hydrogen

What is the reason to go blue if green could eliminate carbon emissions?

Hydrogen is typically advocated as a climate solution with focus on water as the only emission when used, but natural gas and coal is the main source of the hydrogen used today. A key point in the international discussion is how hydrogen can help in decarbonising the global energy supply, and the introduction of hydrogen in "new" sectors. An obstacle in getting to that point is the lack of large-scale production and thereby supply of clean hydrogen. Large scale green hydrogen production with zero-carbon emissions is currently both expensive, and hard to achieve because it requires large quantities of renewable energy. Producing the amount of green hydrogen equivalent to the planned blue hydrogen export through the Norwegian-German hydrogen cable project presented in 2023, would demand large portions of the renewable energy in Norway leading to increased energy prices, an unrealistic political scenario in avoiding domestic debates of what the energy is to be utilised for.

The rapid growth in interest and support directed towards hydrogen has caused several scientists to criticize the plans to use blue hydrogen. Green hydrogen is estimated to become cheaper than blue hydrogen by 2030 and would require carbon prices of 22-46$ /t/CO_2e for blue hydrogen to be cost competitive to grey hydrogen (Longden et al. 2022). This means that large projects could become outpriced by green hydrogen by the time these facilities are able to produce blue hydrogen. Another issue highlighted by critics is the uncertainties relating to how reliable it is to store carbon, alongside the lifecycle emissions of blue hydrogen both upstream and downstream. A peer reviewed study published in 2021, found the lifecycle GHG emissions of blue hydrogen to be only slightly lower than those of grey hydrogen. Even though the CO_2 emissions were lower, release of methane (CH_4) as a biproduct in production and as fugitive gas increased the CO_2e of blue hydrogen as methane is a significantly more potent greenhouse gas than CO_2 (Heyworth & Jacobson, 2021; Longden et al. 2022). The study thereby questioning the idea of blue hydrogen as an environmentally friendly solution, prompting then Chair of the UK Hydrogen and Fuel Cell Association, Chris Jackson to step down from his position, stating that blue hydrogen "at best an expensive distraction, and at worst a lock-in for continued fossil fuel use" (Ambrose, 2021). This concern surrounding blue hydrogen as potentially doing more harm than good, has been highlighted through findings that large oil companies have been amongst the strongest advocates for blue hydrogen (Balanyá et al., 2020). A review of the "hydrogen lobby" mainly consisting of

fossil gas companies, had spent a combined €58.6 million on influencing the policy making process in Brussels (Balanyá et al., 2020). The hydrogen industry participating in 163 meetings with European Commission officials and finding clear resemblances between the demands set out by Hydrogen Europe and the European commissions hydrogen strategy published in 2020 (Balanyá et al., 2020).

5.2. Industry

Equinor, formerly known as Statoil, was founded in 1972 by the Norwegian government with the purpose of managing the county's vast oil and gas recourses (Equinor, 2023). The company was listed on the Norwegian stock exchange, Oslo Børs and New York Stock exchange in 2001, with the Norwegian government holding 67% of the shares as a majority stake holder in the company (Equinor, 2023a). The privatisation of the company happened as a result of internal political pressure and growing concerns of the company's influence on Norwegian energy politics on the domestic level, as well as from the EU pressuring for Norway to comply with EU competition Law and adapt the EUs gas directive (Moses & Letnes, 2017). The company made a strategic renaming of the brand in 2018, to better align with the company's strategy of expanding their operations and becoming a major energy company not only focused on oil and gas (Equinor, 2018; Charge, 2023). The name change removed the direct link to oil and is now an established part of the company's branding (Walsgard & Holter, 2018).

Equinor has set the ambitious goal to become a net-zero company by 2050, through optimising oil and gas production that enables the company to use its portfolio to fund decarbonization; investing in renewables to establish a strong industrial position to create growth and; investing in new low-carbon market opportunities (Equinor, 2022a). To achieve the ambition of becoming a net-zero company by 2050, the company has planned to increase its investments in renewable and low-carbon solutions from 4% of the total investments in 2020 to 30% in 2025 and 50% by 2030(Equinor, 2022a). Seeking to allocate 40% of research and development capital towards the same goal by 2025(Informant1, Equinor, 2022b) Substantial investments have already been

allocated to electrify the oil- and gas production in the North Sea, with an NGO finding that the electrification has had a significant impact on reducing the emissions related to production of oil and gas (Krekling et al., 2020; Nyhus, 2023b; THEMA,2023).

The areas where the company has stated intentions of investing, are closely related to the expertise and knowledge already available within the company (Equinor, 2022a; Krekling et al.,2023). Where the core operations of fossil fuels are set to remain a core driver in the company's transition, this is related to a statement within the interviews of "the fossil fuels themselves are not the issue, the emissions are" (Informant 2). Instead of moving away from the use of fossil fuels completely and thereby disregarding the many ways the resources are utilised in modern society, the intention is rather to invest in the transition away from the high emissions in a way that enables the continued benefits of the resources within society (Informant 2). One of the main benefits of hydrogen is that the energy carrier can be stored, and where hydrogen gas is reactive and explosive if handled incorrectly, Equinor has a is clear advantage in the case of hydrogen as it enables the continued use of their expertise in handling natural gas.

Equinor's low-carbon solutions were split out from the main company in 2020 and has seen a rapid grown from 14 to approximately 100 people in 2023(Informant 1,2023). The increase in global attention towards hydrogen have been noted within the company, and the company have established several projects based on blue hydrogen alongside investments in green hydrogen. The investment in both technologies can be found within the clear statement "I believe the world needs as much green and blue hydrogen as possible, as soon as possible […] but I believe blue hydrogen is going to be important in the implementation phase because of the high demand for renewable energy when producing green hydrogen" (Informant 1)

Something pointed out by both informants is that because there is currently not an established value chain surrounding the large-scale plans of hydrogen, the industry needs the help of the government to enable a stable regulatory framework surrounding hydrogen and incentives enabling the use of hydrogen. "it is likely that the state needs to put in place incentives that enables customers to opt for a more expensive solution such as blue or green" (informant 1).

Stating that “I believe that there are several mechanisms that will lead to a situation where we do not need subsidies, but to establish the industry subsidies are required” (informant 1)

The company is involved in several hydrogen projects; Participation in NorthH2, aiming to produce green hydrogen off the coast of the Netherlands (Equinor, 2020) and the company has a key position alongside RWE in the cooperation between The Norwegian and German government. The cooperation between Equinor and RWE is in line with intergovernmental cooperation aimed at establishing hydrogen production and export infrastructure to deliver hydrogen from Norway to Germany through hydrogen pipelines. This enabling hydrogen to replace coal-fired energy plants and to be used to secure the German energy supply and decarbonize carbon-intensive industry (Equinor, 2023c). Several of the projects Equinor are involved in are currently in investment phases, with timelines on projects to be in operation from 2027/28 to 2030 (informant 1, informant 2).

When questioned about the possible challenges to establishing a hydrogen value chain, both regulations and financial risks in the implementation phase were mentioned. Seeing as blue hydrogen uses the same production methods as those currently in use, but with the addition of CCS, the technological solutions already exist. Equinor have utilised (CCS) in their operations on the Sleipner Area in the North Sea since 1996 (Equinor, 2023b) and have 27 years of experience with development and use of the technology.

5.3. The state

Norway has been a major oil and gas producer for several decades, and the abundant oil- and gas reserves has played a crucial role in the country's economic growth. Where renewable hydropower accounts for a significant portion of domestic energy consumption, the country has become a major energy exporter following the discovery of natural resources on the Norwegian continental shelf in 1969 (Moses & Letnes, 2017). In the establishment of a domestic petroleum industry, the previous experience from managing hydropower resources was used as a guide and the knowledge led to the creation of strong institutions, securing state ownership and political control over the resources. The country avoided the several of the political and economic issues often referred to as a "resource curse", a tendency where countries often experience lower economic growth upon the discovery of large non-renewable natural resource wealth (Moses & Letnes, 2017). The Norwegian government's supportive framework conditions and regulations played an essential part in enabling the petroleum industry to grow and secured that the natural resources would benefit the state and its citizens. Today, the oil and natural gas production constitute 26% of GDP (Stensland, 2023), with the offshore industry in 2020 employing upwards of 200 000 people (SSB, 2021; Menon Economics, 2022).

Petroleum is a pillar of Norwegian energy politics (St. Meld 13. (2020 – 2021); IEA, 2022), and none of the large political parties or national politicians are willing to stray away from the consensus that petroleum and the petroleum industry is an important part of the future (Moe, Sæther & Røttereng, 2022). The role of petroleum as a core part of the economy creates a situation where it is hard for Norway to find solutions to mitigate climate change and reduce emissions, as the efforts to decarbonise needs to happen within the sphere of continued fossil fuel exploration and production (Røttereng, 2018b; Moe, Sæther & Røttereng, 2022). Among the government's efforts to decarbonise is the case of electric vehicles, where policy tools such as subsidies and tax exemptions on new electric vehicles and higher taxes on traditional combustion engines have been utilised by politicians to change consumer behaviour by making the switch to electric vehicles accessible and beneficial as a viable alternative to fossil fuelled cars (Norsk Elbilforening, 2023). Active participation in incentives such as REDD+ aiming to promote the

conservation of forests within local communities, and climate investment funds aiming to accelerate the global energy transition by investing in renewable energy in lower-middle-income countries (Riksrevisjonen, 2018; Ursin, 2018; Setiabudi, 2023). A common thread is that these projects does not directly put pressure on the consensus of continued use of fossil fuels.

An important aspect in the Paris Agreement is the delegation of responsibility to the level of the state and demanding individual nations to set Nationally determined contributions (NDC) (Aklin & Urpelainen, 2018). In the latest update of Norway's NDC in September 2022, it strengthened its previous 2030 target of a reduction in emissions of at least 40%, to 55% below 1990 levels (Office of the prime minister, 2022). The country has submitted its 2050 commitment of GHG emission reduction of 90-95% by 2050, and established goals of becoming a low-emission society [lavutslippssamfunn] by 2050 but have not yet committed to a net-zero target (Climate change act, 2017). Norwegian policy makers have been criticised of not facing the reality of climate change and not taking appropriate action to mitigate climate change in achieving its climate targets. (Osloeconomics, 2022; Haugan & Flydal, 2022; OECD, 2022; DNV, 2022) Several reports and actors voicing concerns that the petroleum industry restricts the development of green industries as a greater concentration of capital and workers are locked in by the petroleum industry even when expectations shows that the export of oil and gas will diminish (Osloeconomics, 2022; DNV, 2023). Investments in green tech in Norway a smaller share of GDP than many other European nations.

Hydrogen became an official part of the Norwegian energy policy in 2016 when the government presented the White Paper on Norway's energy policy: Power for Change (St.Meld. 25(2015-2016)), and a national hydrogen strategy was presented in 2020 to function as a roadmap to the Norwegian (Regjeringen, 2020). The strategy was highly anticipated from the industry envisioning hydrogen as a new industrial adventure and had broad support amongst politicians and environmental groups (Fardal, 2021; Rynning-Tønnesen et al, 2020; Hovland, 2020a). Several of the politicians in the opposition parties, released a report envisioning Hydrogen as a gamechanger for Norway, comparing it to the discovery of petroleum resources and Espen Barth Eide (Labour

party) alongside the labour union advocating the establishment of a state operated hydrogen company, resembling the government's actions in the establishment of the Norwegian petroleum sector(NTB,2020; Hovland, 2020b))

Social profits [samfunnsøkonomisk lønnsomhet] is a core objective of Norwegian politics, alongside the belief that development of Norwegian industry should happen based on market mechanisms, looking to the abilities of the market in allocating the resources where the investments will ensure value (Moe, 2009a; Hansen & Moe, 2022; Meld.St. 36(2020-2021). The means to reduce emissions is at large left in the hands of the market: "Up to the market to determine whether electrification, hydrogen, bio-gas or another technology is most appropriate" (Meld.St. 13(2020-2021), pp. 14). This is backed by the interviewees stating that the company felt they had the government's support in relation to blue hydrogen, but not as the state itself pushing the technology (interview respondent). Investments into new technology is by the government deemed as more interesting when opportunities arise within areas where Norway has a clear advantage in the form of for example geography, location, or pre-existing knowledge (meld. St. 13, 2020).

The support for blue hydrogen in Norway is mainly related to its use in industrial settings, and the potential value from exports. Where there have been several debates surrounding the Norwegian push for hydrogen, but the main consensus is that for Norwegian industry it is a very good opportunity. In relation to the continued cooperation on energy between Norway and Germany, one of the issues that was highly debated was if producing hydrogen with the aim of exporting the product through pipelines for the hydrogen to be burned for energy in Germany. The main consensus was still a positive one towards hydrogen and Norwegian investments in the technology, but there were several concerns if that was the best use of the energy seeing as hydrogen is an energy demanding product to make(NRK, 2023).

5.4 The European Union

The European Union was established in the aftermath of the Second World War with the aim of creating a common European identity, uniting the member states to foster peace, stability, and economic prosperity, and preventing a new devastating war on the continent based on collaboration and mutual dependence between individual nations (Saurugger, 2014). The supranational organ currently counts 27 member states, and in acting as a united entity beyond the boundaries of the individual nations enables the enforcement of collective decisions. The European Union is governed through the European Commission as its executive branch, the European Parliament, representing the interests of European citizens, and the council of the European union, where its member states make collective decisions (Cini et.al., 2019). The European Union has become a significant player in the global fight against climate change and aims to lead the world towards a sustainable and carbon neutral future.

The European "Green deal" was presented by the European commission in 2019, and the 24-page document presented the European Union's ambitious plan of action to transform Europe into the world's first climate-neutral continent (European commission, 2019b). In the words of Ursula Von der Leyen, President of the EC to "reconcile the economy with the planet", stating that "I am convinced that the old growth-model that is based on fossil-fuels and pollution is out of date, and it is out of touch with our planet." (EC, 2019a). The European green deal established the initial roadmap for the EUs plan to decarbonize its economy, and identified several focus areas where policies would be implemented. the President Von Der Leyen stating in 2021 that "*hydrogen could "power heavy industries, propel our cars, trucks and planes, store seasonal energy, heat up our homes" – all with "almost zero emissions"* "(European Commission, 2021a), and Frans Timmerman, European commissioner for climate action stating that "Clean Hydrogen is one of the top priorities in our energy transition,"(EC, 2021b) as he presented the complementary strategy to the commissions green deal, "A hydrogen strategy for a climate-neutral Europe"

(Hydrogen strategy) (EC, 2020a). The long-term aim stated in the EUs hydrogen strategy is to prioritize the production of clean hydrogen from renewable sources, recognizing low-carbon hydrogen as an important factor in the early stages of the energy transition and in the implementation of infrastructure and the establishment of a long-term hydrogen value chain (EC, 2020a).

In the "Fit for 55 Package" presented in the wake of the covid 19 pandemic, the use of clean hydrogen is a key element, aiming for renewable hydrogen to accounting for 50% of industrial demand by 2030 through renewable power and RFNBOs (Renewable fuels of non-biological origins) (EC, 2020b; EC, 2020c). The REPowerEU increased targets to 10 million tons of domestically produced hydrogen and additional imports of 10 million tons by 2050. The RePowerEU plan, or *Joint European action for more affordable, secure and sustainable energy* was published in response to the Russian invasion of Ukraine, as Europe was hit with an energy crisis following the sanctions on Russian gas. EC president Van Der Leyen and Norwegian prime minister Gahr Støre in a joint statement pointed to the crisis as "deliberate manipulation of the European energy market by Russia" (EC, 2022b), and the plan is aimed towards strengthening European independence from Russian fossil fuels, and includes the acceleration of renewable hydrogen infrastructure, research and development, and use. The issue of energy security highlighted even further by the Nord Stream pipeline explosions in September 2022, that ruptured the critical gas infrastructure (NordStream, 2022). Western sanctions following the Russian invasion of Crimea in 2014 showed that coordinated sanctions directed towards the Russian economy proved an effective tool with only limited fallout on its member states (Christie, 2014).

The European Union's member states are split in how to define renewable energy, with current debates surrounding whether atomic power generation is to be defined as renewable or not leading to how hydrogen is defined as "clean" or not. It is an increasing understanding that atomic power might have a larger part to play in the transition for member countries to reach emission targets, but it is a divisive issue. The discussions surrounding the definitions of what counts as renewable or "clean" energy also causes some discrepancies in relation to blue hydrogen and its place in the category of being a "clean" energy source. Fossil hydrogen is excluded in the ECs proposals of revisions the EUs Renewable Energy Directive (RED), but the inclusion of fossil-based

hydrogen across the “fit for 55” package undermines this stance (Global Witness, 2021) within the European framework based on the assumed effectiveness of CCS. The EC and EP has in communications stated that the EU is moving away from the use of colors to categorize hydrogen, and rather utilizing the definitions of “clean” and “low carbon” hydrogen (EP, 2023).

5.4.1 The European Union’s take on natural gas and CCS.

The European commission is backing CCS as one of seven key technologies to enable decarbonisation (EC, 2018). Some member states have expressed concerns about the potential risks associated with carbon storage within their territories, such as leakage and seismic activity as well as the public opposition and viability of CCS (Slavin & Jha, 2009; Wettengel, 2023). With the Norwegian continental shelf providing large storage capacity this has lead to an understanding that “when some member states are hesitant to have ccs within their territory, we [equinor/Norway] have the ability to do it.” (Interview).

Following the Russian invasion of Ukraine in 2022, Europe experienced an energy crisis as sanctions against Russa saw the European energy market turn away from Russian imports of natural gas. EC president Von Der Leyen and Prime minister Støre in a common statement framed the energy crisis as a direct result of Russian manipulation of the energy market (EC,2022).

As a part of the EU’s position of fossil fuels as incompatible with the commissions vision in the “green deal”, the European union has stated that it aims to phase out fossil fuels and a part of this is that the EU will not allow new long-term contracts to extract natural gas to be available after 2049 (EC, 2021; Cheng, 2023). A move corresponding with the aim to decarbonise in reducing stranded assets. Representative for the conservative party (Høyre) commented that the statement from the commission “is not an end date for Norwegian production of natural gas, but a reminder that the development of the north sea needs to happen within the frames of the climate policy” (Nyhus, 2023a) Norwegian minister of Oil and Petroleum, Terje Aasland stating

that ”we do not expect that Norwegian gas will be limited by the market within the next decades” (Nyhus, 2023a).

6. Analysis and discussion

6.1. Equinor

Equinor is the largest domestic energy incumbent in Norway, and it has made several strategic changes to the company's branding and investments in the last decade aiming to diversifying their operations. The change from Statoil to Equinor itself stands as a clear sign that the company saw a strategic long-term interest in creating distance between the brand and the negative associations towards the role of emissions from the oil and gas industry in climate change. By distancing the company from its historic position as an oil company it shows that the company have vested interests in at least portraying the image of being environmentally conscious and acknowledging the issue of climate change and global warming. Hydrogen as an important part of their current plans involves the continued use of fossil fuels, with the additional aspect of continued investments in carbon capture and storage technology. Even though the company have diverted parts of their investments into renewable energy, mainly aiming to reduce emissions related to the petroleum installations in the North Sea, oil and gas remain as the company's core operations and blue hydrogen is no exception to this.

Alongside most of the large carbon incumbents in the global energy sector, Equinor could note record breaking profits in 2022, meaning oil and gas is currently a very profitable business to be in (Stensland, 2023). From a business perspective, record breaking earnings is at least in the short-term perspective not an incentive to reduce production. In fairness, as a company, not taking advantage of the investments made into their core operation when profits are extraordinary, would be a bold move. At the same time, the interviewees left no doubt that the climate crisis is a very real concern within the company. Even though hydrogen maintains the carbon base of the company's operation enabling the company to avoid radical change, rather seeking opportunities that enable incremental change that enables Equinor to convert over time. This would be in alignment with Equinor's goal of using their existing portfolio to fund a low-carbon transition (Equinor, 2022), and that the company is putting efforts into diversifying its operations as a long-term strategic choice in order to stay relevant in a decarbonised future.

Through the unique experiences and knowledge obtained as an operator in the challenging conditions of the North Sea, the company has established itself as a leading expert on the molecular energy of hydrocarbons. With the vast network of connections and subcontractors Equinor also has a clear advantage when attempting to predict future needs in the market, and the ability to utilise this network to influence decisions. The knowledge and network held by the company, can be a valuable tool when shared with policy makers seeing as it can both educate and influence the politicians whilst enabling Equinor to maintain a close relationship the governing institutions, enabling them to be included in the policy making process. It is however possible that may create a situation where the vested interests of the company become the viewpoint taken by the state, either because the policy makers have been influenced by the ideas proposed by incumbents, or because the incumbents are sharing knowledge in a way that benefits their vested interests.

Where it is likely that the rapid technological innovation will provide viable alternatives to fossil fuels in most sectors as time passes, doubts exist to the ability of electron-based energy to provide the utility and advantages of fossil fuels in some sectors. A valid point in chemical industries such as fertilizer production, as the production of this essential part of modern industrialized farming uses the chemical molecules as vectors in fertilizer production, not only as a fuel source(Seehusen, 2020). This pointed out in one of the interviews, that fossil fuels still had a role to play in society where no other viable alternatives are available (Informant 2). Equinor as an incumbent have a vested interest in the continued use of fossil fuels and the maintaining of the idea that fossil fuels are essential in some areas. At the same time, it is unlikely that society will accept to lose benefits they have gained through the globalization of the market, or the ability to use services that are today provided through services that are high polluters. Many of these sectors also have an essential role in the energy transition as materials and components used in renewable technology are a part of global trade(IEA, 2019). The belief that fossil fuels will be a part of the future in certain areas, contradicts the view held by many environmental groups that seek to banish fossil fuels from society. Meanwhile, some NGOs such as Bellona, argue that there is a need for solutions such as blue hydrogen because it is currently not realistic to see an energy

transition based on the wishful thinking that the transition can happen fast enough if the tools available to mitigate climate change are left unused (Fardal, 2021).

Estimates show that the demand for oil and gas will slowly decline over the next decades and be replaced by alternatives such as renewable wind and photovoltaic before the global reservoirs of fossil fuels are empty. Meanwhile the Norwegian governments stance has remained clear that the Norwegian petroleum industry is to remain a pillar of the Norwegian economy for decades to come. Even though there are short-term benefits and profits gained from oil and gas, this does not translate to "business as usual" as a smart long-term strategy for the company. With the rapid growth and reduced costs of alternative solutions alongside the international goals of decarbonisation, at some point it is possible for low or zero-emission alternatives to be viable options able to outcompete the fossil fuels. This leaves the large incumbents the two options of winning or losing in a green transition, the future business case of the company if all assets are locked-in towards fossil fuels is one that sees the company holding sunk assets in a diminishing market, rendering them obsolete.

Equinor has set an ambitious long-term target of becoming a net-zero company by 2050, accompanied with a long-term strategic investment plan allocating 50% of gross investments towards renewables and low-carbon solutions by 2030 (Equinor, 2022b). While this is not a legally binding target, it is worth noting that the Norwegian government does not have a set timeframe of reaching net-zero and only stated the intention of becoming a low-carbon society by 2050. Equinor's target of allocating large investments towards renewable solutions and utilising their existing knowledge, dictates that they need somewhere to direct these investments. This makes the choice of pursuing hydrogen a logical choice, especially when considering the current international hype surrounding the energy carrier with large ambitions set out by the European union as a major importer of Norwegian gas. Equinor is by no account alone in pushing for hydrogen on the international arena, but as the largest domestic incumbent they have a clear interest in pushing the technology.

At the current moment, Hydrogen is not a profitable venture. Establishing a new market and a

value chain requires large investments in infrastructure, incentives to build a demand and a supply, and stable framework conditions that enable investors to see a profitable long-term outcome. From the perspective of a company, investing in the technology is a financial risk for the company and securing government support in the form of subsidies and favourable regulations that incentivises the establishment of a value chain and relieves the financial risks, is a clear vested interest for the company. Having the security of the state both on the financial side and its ability to demand low-carbon alternatives to be used in industry or transportation, makes the state as an invested partner in the venture beneficial to the prospects of the technology. Where Equinor's stance is that "low-carbon" hydrogen will be essential in establishing a value chain, mainly because of the limited availability of green hydrogen, securing favourable conditions for hydrogen in general can be argued as beneficial to the company. The company has voiced equal support towards both "clean" and "low-carbon" hydrogen, and are invested in projects within both solutions. In a long-term perspective, the creation of a hydrogen value chain would enable them to establish themselves as a first mover in establishing the industry, and if conditions makes blue hydrogen unfavourable their investments in green hydrogen would still benefit from the established market.

With the state as the majority stakeholder in the company, it puts the Norwegian state in a position to influence the direction the company is headed with a massive share stake in the company and therefore a clear vested interest both in the profits the company generates and the future survival of the company. The transparency within the Norwegian state as a majority stake holder could provide for an easier transition away from fossil fuels if that was set as a clear goal from the state. However, the there are several things that points towards this not happening. The Norwegian state presented the White Paper on Greener and more active state ownership (Meld. St. 6 (2022–2023)) in October 2022. Several investors voiced concerns about Equinors ability to reach climate targets in alignment with the White Paper leading up to the general assembly(Rustad, 2023b). A proposition to align the company's climate strategy to the white paper was presented by WWF and Greenpeace, whom both own one share in the company and therefore is able to propose changes at the general election, saw the government use its position

in voting against the proposition (Rustad, 2023a). This shows a clear divide between the company own interest's vs the stated interests of the Norwegian government, and also points towards the fact that even within the gateways provided the Norwegian government, there are limitations to Norway's influence on the company or the government's ability to go against the vested interests of the company. With the governments clear intentions of continued oil and gas production on the Norwegian continental shelf, there is no need for the company to fear that the Norwegian government aims to push for radical change.

6.1.1. Global competition

The interest in blue hydrogen expands into the sphere of CSS for the obvious reason that carbon capture and storage is a prerequisite for low-carbon hydrogen from natural gas. The 27 years of experience in using the technology to purify the natural gas reserves from the Sleipner Area, means that Equinor has unique experience with the technology and as well as having invested large sums into the research and development of the technology. These investments have been heavily subsidized by the government, and where the technology have been debated in the past it is now widely acknowledged as an essential tool to mitigate climate change.

A different aspect of this discussion is however made clear when looking at the international agenda, more specifically at the Inflation Reduction Act (IRA) passed in the United States. The IRA has caused some stir both in the industry and within the European union because there is a worry that the subsidies and incentives found in the policy could see companies favouring to set up shop in the United States instead of in Europe (NHO, 2023). This in part because the inclusion of a revised tax credit for carbon oxide sequestration (T45Q), makes the case that investments into ccs technology could be a profitable side quest for incumbent actors. This because the bill realises an increase in tax returns for companies using CCS, with an increase from $50 pr ton carbon captured today, up to 85$ for every ton carbon captured as a part of the production (IEA, 2023). In addition, the tax includes a subsidy of 180$ pr ton carbon captured from the atmosphere (IEA,2023), meaning that the companies who have access to carbon capture technology and storage capacity could see major benefits from this venture (Halper, 2022). This could be seen as

a possible result of large carbon actors using their vested interests in an effort to lobby the United States government, to secure benefits for actors invested in CCS technology mainly consisting of large carbon actors (Halper, 2022). Where this is not the focus for this thesis, Equinor does have operations outside of Norway and have invested heavily in the technology making their knowledge of CCS a valuable competitive asset in itself. Equinor's competitive advantage in this field could therefore be argued as a reason to push blue hydrogen to serve the company as a continuation of CCS technology gain a competitive advantage.

6.1.2. Summary

The findings point towards Equinor pushing blue hydrogen both from the perspective of avoiding radical change, with the background that the incremental changes allows Equinor the option of diversifying its assets. As well as establishing competitive advantages by taking advantage of their convertible knowledge. The high costs and the amounts of renewable energy needed for large-scale "clean" hydrogen production today, makes blue hydrogen essential in the European union's decarbonisation plans. Where the company has no reason to fear that "clean" hydrogen will be outcompeting blue in the short term, their investment in green hydrogen projects allows them to benefit from the establishment of a hydrogen value chain long-term, even if blue hydrogen is phased out. This allows the company to rely on the revenue from established assets to diversify their assets and at the same time build towards a long-term strategic advantage in a low-carbon niches.

6.2 State

Norwegian politicians have several problems when attempting to address any changes in Norwegian energy politics. Norwegian politicians and the country in itself is regularly facing criticism for not doing enough to mitigate climate change, but challenging the continued consensus of viewing fossil fuels as the backbone in Norwegian economy is difficult based on a variety of factors. The politicians themselves are elected representatives of the population, and where large majorities of the European population are concerned about the impact of climate change caused by human activity, the Norwegian population is an exception. A third of the population believe that climate change will not impact them in the next ten years, and one in four believes climate change is not mainly caused by human activity(NTB, 2021). This means that talking about energy and climate as one and the same is an incredibly difficult job for any politician, and with higher trust in oil companies than other nationsand a history of Norwegian oil narrated as "better" than the oil produced elsewhere, any politician seeking to be re-elected needs to tread lightly. There are several high standing politicians who portray the climate crisis as nothing to worry about. The right-wing Progress Party has repeatedly boasted loudly about climate politics threatening the individual rights of the citizens and undermining scientific evidence. Statements such as party leader Listhaug's response to questions if she believes human activity has the caused climate change "I believe it is not interesting to discuss it. The most important thing is to make sure that we are doing something about the climate changes we can see, and that means we can use the Norwegian technology to make the world greener" (Johannessen et al., 2019). Statements serving to boost the already concerning number of Norwegian climate change deniers (NTB,2020) and pushing a narrative of energy in relation to climate politics as unimportant and only used to push an agenda.

In the case of blue hydrogen, the main focus within the EU and industry is the need to decarbonise and hydrogen as a solution to decarbonise several high polluting sectors. The Norwegian politicians when talking about blue hydrogen are focused on the possibilities the technology can provide for Norwegian industry, and the prospect of blue hydrogen as an export industry. The

technology as a valuable tool to decarbonise and mitigate climate change is often overlooked, possibly on purpose.

The petroleum industry employs a large number of people and previous oil crisis have shown the consequences both on a local and national level when a large number of the workforce is faced with layoffs and uncertainty. The workers' rights being the concern of the large and powerful organisations, The Norwegian Federation of Trade Unions (LO) is often a vocal and strong supporter or opposer to political ambitions to change. At the other end of the table is the large organisations seeking to protect the interests of the companies, who are concerned with the consequences any policy solutions might have on the industry and the interests they represent. In cases where both the organisations representing the workers and the corporations agree, it therefore creates an easier window for the politicians to implement policy solutions because two strong vested interests are already united. This can be found within the discussions surrounding the push for blue hydrogen, as the technology can create opportunities for both industry seeking to limit emissions or diversify their operations, and within the workers organizations. The push for blue hydrogen is not a direct competitor to the energy needed in the industry, because it uses natural gas in production compared to green hydrogen that would put a demand on Norwegian renewable electricity, and conceivably cause increased energy prices. It also encompasses the workers, as it is not a direct threat to the petroleum industry and their livelihood but an extension of the industry and a complementary solution and not a radical change that would cause any insecurity in the direction of losing jobs.

The way blue hydrogen is talked about in Norwegian politics is highlighting its value as a new industrial venture that utilizes the expertise and manpower within the offshore sector, both directly linked to the installations in the North Sea, and it also promises to utilise many of the infrastructure components used in the existing sector. This meaning that it instead of creating a direct competitor to the industry and its subcontractors, it is talked about as an opportunity where this knowledge and the services these companies and workers provide are essential parts of the opportunity. This in contrast to many of the aspects of other sources of renewable energy such as wind- and photovoltaic, where the technology and components differ to such an extent

that it would not be a complementary venture and the long-term value of these assets are not dependent on a large, specialized workforce.

The national policy on petroleum clearly states that the state wishes to provide stable conditions for the industry, and where many of the renewable projects demands large and visible infrastructure that have created significant opposition in public opinion, a hydrogen production plant based on blue hydrogen is a relatively small, neutral industrial plant. There are limited risks that a production plant will interfere with the breeding grounds of reindeer and cause negative impacts to the native Sápmi cultural inheritance. With subsea cables viewed as one of the more interesting export options, large and visually unappealing power cables hanging over the Norwegian fjords are also outside the scope of blue hydrogen. This could be a different scenario if the government decided to actively promote green hydrogen, as the production would demand a large supply of renewable electricity. So even though both green and blue are equally supported in the government's hydrogen strategy, green hydrogen is usually overlooked in the domestic debates.

The industrial policy in large leaves the decisions of what technologies the Norwegian industry should invest in the hands of market forces and trusts market conditions to decide where the investments made will create the largest values. This attitude has the potential of creating additional issues. In co-operation with the government's stance of maintaining the petroleum sectors position in the Norwegian economy, it enables the Norwegian government to distance itself from the issue of mitigating climate change because it is up to the market to decide what is the best solution. Where value in the modern economic paradigm is designated by what someone is willing to pay for something in a market; pollution, environmental and ecological damage, to name a few, fall outside the scope of the market mechanisms (Mazzucato, 2013). The national government does make use of incentives such as carbon taxation and emission caps to influence the market to account for these negative effects, but these incentives have limited effect if they are not at a level where they make an impact. If these incentives are too high, they might also influence the companies to be creative in finding workarounds. With the additional pressure from LO and NHO on the government to safeguard the benefits of their members, it limits the governments room for action to increase or change the incentives. It also enables the politicians

to criticize the actions taken by companies whilst at the same time avoiding responsibility themselves.

It also opens the door for large established companies to utilize their position to influence the politicians and policy solutions, gaining support for their chosen solution. This is particularly relevant to blue hydrogen as a technological solution because it is backed by Equinor, a company with strong ties to institutions and politicians alike. This alongside the large resources they have available makes it easier for a large company to propose their preferred solutions, than it is for a small startup with limited funds and resources who do not have an established network ready to listen to their proposals.

6.3. The European union

The European Union have set ambitious targets to decarbonize the European economy, mainly through the European green deal. The clear intention set out in the plan is to decarbonize the European economy and move away from the use of fossil fuels. There are several components to the EU's desire to decarbonize, and it is a clear interest both to the union and its member states to obtain the goal of decarbonizing without the shift causing negative effects on the European economy. Both the Covid-19 pandemic and the Russian invasion of Ukraine became situations where the EU directed large investments towards renewable energy, but the increase of renewable energy in the European grid highlighted that more renewable energy from intermittent energy sources created the demand for energy storage. Hydrogen was proposed as a key element in the European Union's plans of decarbonization in the green deal, but it has since then seen increased momentum.

Hydrogen technology has been promoted as a key component in achieving the EU's plans, as the use of hydrogen enables a decarbonization of heavy polluting industries, in addition to the fact that a move away from fossil fuels demands some sort of energy storage which hydrogen can

provide. The push for hydrogen is made even more ambitious seeing that it includes plans of implementing the technology in sectors where hydrogen use is not yet established. The hope of using hydrogen to stimulate economic growth and enhance the competitiveness of European industries in the global market without the carbon footprint of fossil fuels, depends on access to the resource. In other words, a large part of the European Union's plans of decarbonization relies on the creation of a hydrogen market, value chain and a large increase in supply.

This is hindered by the fact that green hydrogen is an expensive product to manufacture, and the European Union has limited amounts of renewable energy that can be set aside to be used for hydrogen production. The EU therefore has a clear incentive to influence Norwegian energy politics and advocate for the establishment of a Norwegian hydrogen policy that favours the EU and their hope to use hydrogen as a key part of their ambitious plan of leading the world towards a greener future. With internal debates surrounding the definitions of renewable energy, this can cause delays in production within the union, and pushing for Norwegian hydrogen policy to enable the rapid growth of hydrogen production in Norway can also help maintain the momentum of the technology if internal debates create temporary delays. By utilising the Norwegian stand on petroleum as an important part of the national economy for years to come, the European Union can utilise this to their advantage in creating favourable conditions for blue hydrogen to ensure supply. Promoting the use of CCS technology aligns with their vested interests in enabling the technology to be used as a mitigation tool in reducing emissions.

The EU is already a very influential actor on Norwegian politics through Norway's membership in the EEA and the regulations Norway needs to implement access to the internal market. The Norwegian position as an important partner to the EU was further strengthened through the energy crisis as Norway took over as the largest exporter of gas to the European Union. Norway have obtained a reputation of being a stable and reliable partner in securing the European energy supply, recently highlighted by geopolitical events. The close relationship between the two parties enables Norway access to the European internal market, and in turn creates a clear advantage for both parties in research and development, enabling projects of mutual interest in creating the technological solutions needed in the energy transition.

From the Norwegian perspective; the access to the European market is incredibly important, but there are several concerns within the Norwegian public opinion and political parties that the European Union has been able to shape and influence Norwegian energy politics to an extent that constitutes a danger to the Norwegian control over its resources. The European Union has a clear goal of creating a value chain, and the access to Norwegian energy is a part of the security of the European countries and so the EU still has a clear interest in influencing Norwegian energy policy.

7. Conclusion

7.1. Conclusions / findings

Why is hydrogen so important in Norwegian energy politics?

When looking at both the technical aspect of hydrogen production and the interests of the industry, state and the EU in their vested interests of pushing blue hydrogen, and hydrogen in general both Equinor and the EU have clear and ambitious goals based on the idea of climate change as an imminent risk that needs to be addressed. The Norwegian government however, does not stand as a convincing actor of change.

Blue hydrogen technology fits the aspect of being a solution to several issues at once, almost to the point of promising to be a change that creates no losers. It is portrayed as one solution with the ability to solve different issues encompassing the policy areas of industry and energy as well as international politics and climate politics alike but is mainly argued by national politicians as an industrial opportunity. Highlighting the idea of Norway's contribution to solving climate change by using its unique combination of advantages to create opportunities for economic growth without radical change that sees the end of the petroleum industry.

The geographical location and large assets invested in the North Sea enables the production of blue hydrogen, thereby helping others decarbonize and aids in the creation of a value chain for hydrogen that in the long run will transition from blue to green. The creation of a hydrogen value chain that in the long-term will be based on green hydrogen is not seen as a threat to the national GDP or vested interests in the current scenario of only "green" hydrogen, because it is not thought to happen in the immediate future. Using the technological knowledge from the petroleum industry to create new innovations to aid in future mitigation efforts to stop climate change,

Even though the renewed support for hydrogen technology is closely related to the climate crisis, the hype towards blue hydrogen should not be perceived as a sign of radical change within the scope of Norwegian energy politics and domestic debates. The petroleum policy of continued production and use of fossil fuels is a consensus the politicians are not inclined to change in the

current circumstances, and the image of Norwegian oil and gas as a better option to oil and gas as well as a large part of the populations doubt as to the reality of climate change, sees the political parties actively pushing for radical change to maintain a position on the outskirts of the policy decisions.

Energy as an essential part of modern society creates a situation where there are many vested interests in the energy system, but the vested interests does not always align. In situations where vested interests are working towards a common goal, creating policy solutions based on a combination of beneficial factors that unites the vested interests is easy. In the case of climate change, the polarized debates and strong vested interests upholding the carbon-based energy system makes it harder to obtain policy solutions, because a united goal is hard to achieve. Where climate change is a global issue, the common understanding within the literature tells us that achieving an energy transition requires large scale cooperation across borders and sectors. Varying views as to whom should be responsible to fix the issue, and where efforts have been taken to give the responsibility to nations by the Paris agreement, certain actors have tried to diminish their own responsibility to tackle the issue and trying to escape responsibility to clean up their own mess.

7.2. Case and limitations

The study could have benefited from a larger group of informants with different backgrounds. This could have provided a more nuanced interpretation of the Norwegian interest in blue hydrogen from the level of the state and the EU. The knowledge and experience of the informants did however touch upon and provide valuable insights on both these areas.

The study has a limited potential for generalisation as it only seeks to look at the specific case of Norway. At the same time, the Norwegian state was an active agent in establishing the Norwegian petroleum industry and holds the position as the majority shareholder in Equinor. Making the case of blue hydrogen an interesting case because

looks at a very small part of the complex energy system, and there are limitations to the generalisations to be drawn from the findings.

7.3. Further research

I expect that the recent interest in hydrogen will create several opportunities for further research on the topic of hydrogen, and looking deeper into the political debate both in Norway and internationally to establish if a push for hydrogen is enabling a green transition of the energy sector or if the investments would be better utilised when aimed at other solutions.

I believe the combined focus of technological and political aspects is particularly interesting, as it touches on the human aspects of belief systems and values alongside the aspect of technological limitations and benefits both the technology and climate science. I see a gap in the literature combining these aspects with the economic perspective, particularly in the case of Norway where social profits are often utilised by politicians as an important variable in the decision-making process. The combination of different areas of study would enable a deeper understanding of both how well mitigation efforts are designed and enables a critical perspective on biases and common “truths”.

I believe further research into the underlying reasons behind the concerning number of climate deniers in the population, could become essential to make an energy transition possible in Norway and enable a better understanding of what can be done to educate the population. The lack of trust in scientific research poses a real issue for the democratic principles of government, and especially going forward as Norway will not be exempt from having to manage issues related to climate change such as mass migration.

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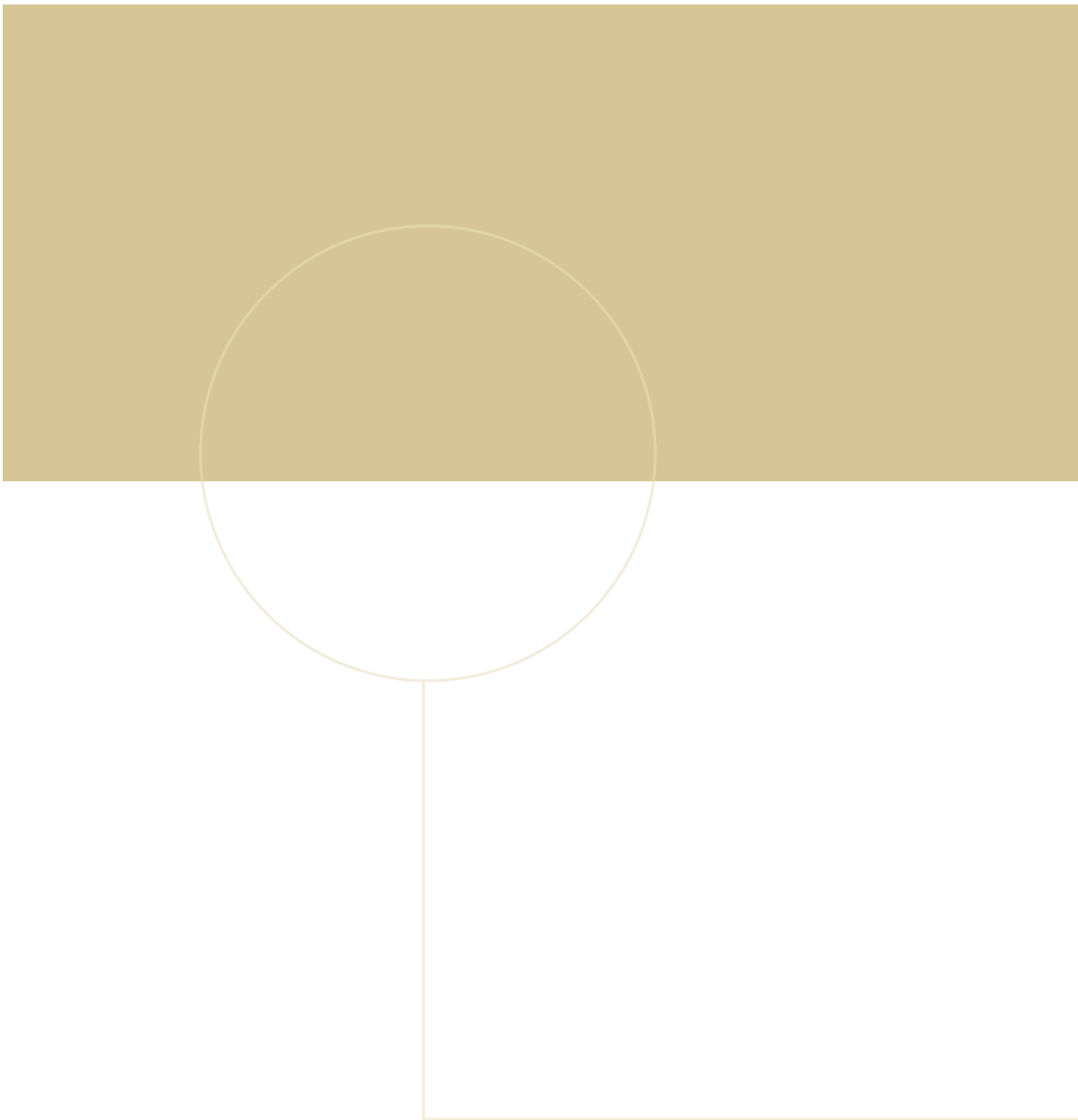

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