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Implications of the resource rent tax on onshore wind

A study on the implications of the resource rent tax on onshore wind

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Master thesis in Economics and Business Administration

NORWEGIAN SCHOOL OF ECONOMICS

Preface

This master's thesis was written in the fall of 2024 as part of the master’s program in Economics and Business Administration at the Norwegian School of Economics (NHH). The thesis consists of 30 ECTS credits and was completed within the specialization of Financial Economics.

We primarily chose to write about resource rent taxation on wind power because of its political relevance. Taxation is a key driver in maintaining Norway's high standard of welfare. However, if implemented incorrectly, taxation can be destructive and deter the growth of Norwegian industries.

First and foremost, we would like to thank Samuel James Piotrowski for engaging discussions, critical input, and valuable insights. It has been a privilege to be guided by someone with such extensive knowledge of finance.

We are also humbled by the opportunity to explore how financial theories apply to real-world scenarios. We are especially grateful for the reminder that economics is most interesting when it has high societal relevance. Our collaboration has been constructive and demanding, yet consistently accompanied by a sense of humor, making the process enjoyable and rewarding.

We would also like to thank the industry players who generously shared their knowledge and insights for this project, particularly Cloudberry Clean Energy, Fred Olsen Renewables, Nordic Wind, and Eviny. Additionally, we are grateful to NVE for publishing market data and analyses.

Finally, we wish to thank our parents for setting exemplary standards of work ethic. We are also grateful that they raised children who are a pleasure to collaborate with on a master’s thesis.

Norwegian School of Economics
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Andreas Anthon Skeisvoll Grimsmo Haldor Høiby

Abstract

To minimize disruptions to the socially optimal allocation of resources, it is essential to design taxes that are as neutral as possible. Resource rent, a super-profit generated from exploiting scarce natural resources, can theoretically be taxed neutrally. Successfully designing a neutral tax would enable the collection of necessary taxes to fund the welfare state without influencing investment decisions.

This thesis examines how the resource rent tax impacts future investments in the onshore wind industry and the broader consequences of the tax. The analysis is based on realistic cash flow models and sensitivity analyses. Data sources include survey responses from six wind power companies and five renewable energy analysts, in-depth interviews with four wind power companies, a consultation with a specialist auditor from the Norwegian Tax Authority, and data published by NVE. Since the tax framework has yet to be finalized, the research considers two possible scenarios. The difference between these scenarios is whether the government will provide payouts for negative resource rent tax.

In the scenario without payouts, the resource rent tax reduces the IRR by 3% from 6.3% to 6.1%. The tax does not pose a financial barrier and should have a minimal effect on future investment activity from a financial perspective. In the scenario where the government provides payouts for negative resource rent tax, the tax increases the IRR by 17% from 6.3% to 7.4%. This is a significant increase and should contribute to higher investment activity.

The introduction of the resource rent tax has increased the perceived political risk associated with Norway and reduced its competitiveness as an investment destination. This has led to a decline in international ownership and potentially reduced the country’s ability to attract capital for new wind projects. Additionally, the tax has failed to improve local acceptance, a key bottleneck for onshore wind development. There is also a potential spillover effect as there are concerns that the resource rent tax could eventually be implemented for offshore wind. This uncertainty about future regulatory conditions can stop new investments in the offshore wind sector, as investors are unsure of the framework governing their investments. Combined, these consequences threaten to slow wind power development in Norway, potentially shifting the country's energy balance from a surplus to a deficit.

Contents

1. Introduction

1.1 Relevance and purpose

On September 28, 2022, Prime Minister Jonas Gahr Støre and Finance Minister Trygve Slagsvold Vedum announced the government's proposal to introduce a resource rent tax on wind power. The proposal sparked strong reactions from the wind power industry and local stakeholders. Fornybar Norge, the industry association for renewable energy producers, argued that the resource rent tax would halt investments in renewable energy and jeopardize Norway's green transition (Fornybar Norge, 2023).

Several of the country's largest wind energy companies criticized the proposal as industry-hostile, warning of significant consequences for innovation and employment. Following months of debate, the Norwegian Parliament decreased the effective resource rent tax rate from 40 % to 25%. The government argued that a well-designed resource rent tax would not affect investments, while it ensures that the state takes an equal share of all revenues as it covers all costs (Regjeringen.no, 2023).

However, during the consultation process, industry players questioned whether the resource rent model would be neutral in practice. One of Norway's largest wind energy producers, Aneo, argued that the resource rent tax is not investment-neutral and would require increased electricity prices to make new wind power projects viable. The company also underscored that the tax could deter future investments, negatively impacting Norway's renewable energy growth and its broader ambitions for the energy transition (Aneo, 2023).

Cloudberry Clean Energy, a Norwegian wind company listed on the Oslo Stock Exchange warned against the implementation of the tax with the following statement (Cloudberry Clean Energy, 2023):

> If the resource rent tax is introduced as proposed, the government's own goals for emission reductions, energy balance, and industrial growth will become impossible to achieve. Additionally, the government risks existing wind power plants going bankrupt, which could result in the termination of many TWh of long-term power purchase agreements with energy-intensive industries.

These statements illustrate how the introduction of the resource rent tax has fueled polarization between the state, represented by academic and theoretical perspectives, and the industry. The state argues that the resource rent tax model, in theory, is neutral and does not influence investment decisions. The industry, on the other hand, argues that the resource rent tax introduces significant financial burdens that can deter future investments, leading to numerous negative consequences.

This debate underscores the importance of examining the resource rent model where deviations between theoretical expectations and practical outcomes can arise. By analyzing the financial impacts and consequences of the tax, this research aims to contribute to a more constructive dialogue between the state and the industry during future evaluations and adjustments of the resource rent tax model.

1.2 Research question

The research question for this thesis is:

"*What are the financial impacts of the resource rent tax on future investments in the onshore wind industry, and what are its consequences?*"

The research question is first addressed by examining the financial impacts of the resource rent tax for new wind power projects. Since the final design of the tax has yet to be finalized, the discussion considers two potential outcomes of the tax. The effects of the tax are analyzed using realistic cash flow examples and sensitivity analysis. These cash flows and sensitivities are based on data from NVE, responses from surveys sent to companies and analysts, and insights gathered through in-depth interviews with Cloudberry Clean Energy, Fred Olsen Renewables, Nordic Wind, and Eviny.

The study then examines the consequences of the resource rent tax. Firstly, we look at how the tax affected the perceived political risk associated with Norway. Furthermore, the analysis assesses how it affects Norway's competitiveness as an investment destination compared to other Nordic countries, and lastly, how it may impact Norway's power balance.

1.3 Structure of the thesis

The thesis is divided into 8 main chapters. Chapter 2 introduces Norway's wind power industry, starting with an overview of power production volumes and geographical locations. This is followed by an analysis of cost trends, electricity price development, and additional revenue streams available to wind farms. Chapter 3 delves into the historical profitability of the wind power sector, exploring the excess returns that have motivated the introduction of resource rent tax. Chapter 4 introduces the survey that was distributed to companies and analysts. In Chapter 5, we introduce key tax theories, focusing on the concepts of neutral and distortionary taxes. The chapter further elaborates on theoretical guidelines for tax design, with particular emphasis on principles from Norwegian tax reforms and policy documents. Chapter 6 provides a detailed review of the resource rent tax model for onshore wind farms. Chapter 7 addresses the financial implications of the resource rent tax on future wind power projects. Chapter 8 examines the consequences of the resource rent tax, focusing on the signaling effect of the tax, competitiveness with the Nordic countries, and the potential impact on Norway’s power balance. Chapter 9 provides a conclusion to the research question and a suggestion for further research.

2. The wind power industry

2.1 Production and location

Norwegian onshore wind has an average annual production of 16.9 TWh[1] produced by 65 wind farms (NVE, u.d.). This is equivalent to the electricity consumption of approximately 850,000 Norwegian households. In 2023, onshore wind production covered approximately 10% of Norway’s total electricity consumption and accounted for 9% of total production (Statnett, 2024b). Figure 1 shows the development of the aggregated installed onshore wind capacity in Norway since 2000. The data reveals that the majority of wind power capacity was installed between 2017 and 2021. This investment surge can largely be attributed to supportive policies, including mandatory electricity certificates introduced in 2012 and favorable depreciation rules from 2015. The deadline for commissioning wind power plants to qualify for these support schemes was December 31, 2021. Since then, no substantial new capacity has been installed. This shows the significant influence policy changes can have on investment activity.

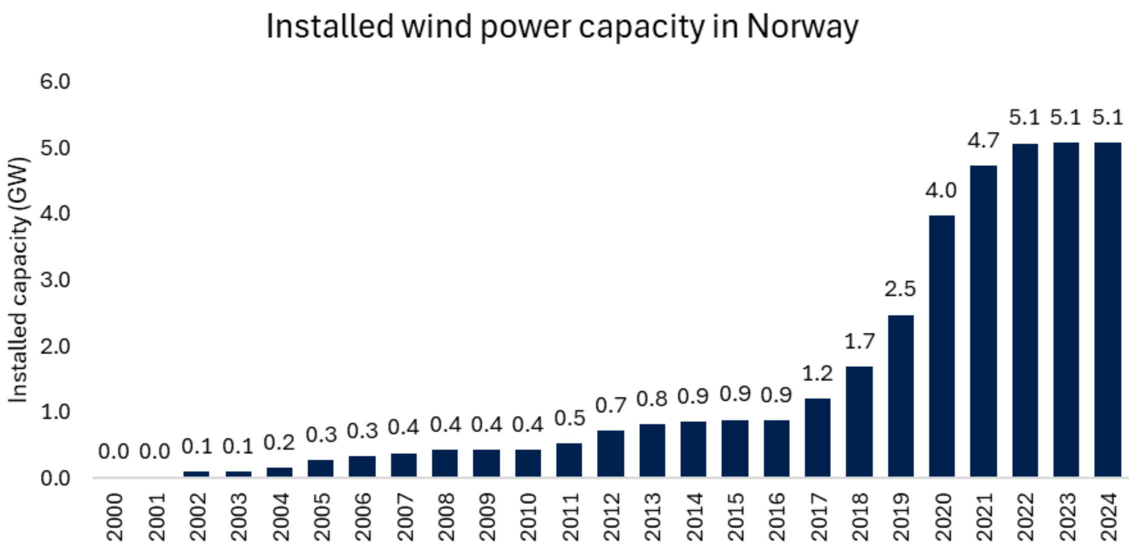

Figure 1 - Installed wind power capacity in Norway (2000-2024). Source: NVE

[1] For a breakdown of power figures, see Figure 44

The absence of new wind power capacity in recent years is expected to continue. In NVE's report *Long-term Power Market Analysis 2023*, they predict marginal new onshore wind power production by 2030. Figure 2 shows NVE's expected power production from 2023 to 2040. The figure reveals that NVE only expects an increase of 0.9 TWh (equal to the consumption of 45,000 Norwegian households) by 2030. This is due to limited time for planning and licensing beyond what is already planned. Furthermore, the figure shows that by 2040, onshore wind power generation is expected to increase by 37% to 23.1 TWh (Kirkerud, et al., 2023), covering the consumption of approximately 1.2 million Norwegian households. However, NVE emphasizes that there are considerable uncertainties to 2040 estimates, especially in the light of the introduction of the resource rent tax, as it remains uncertain how it will affect the willingness to invest.

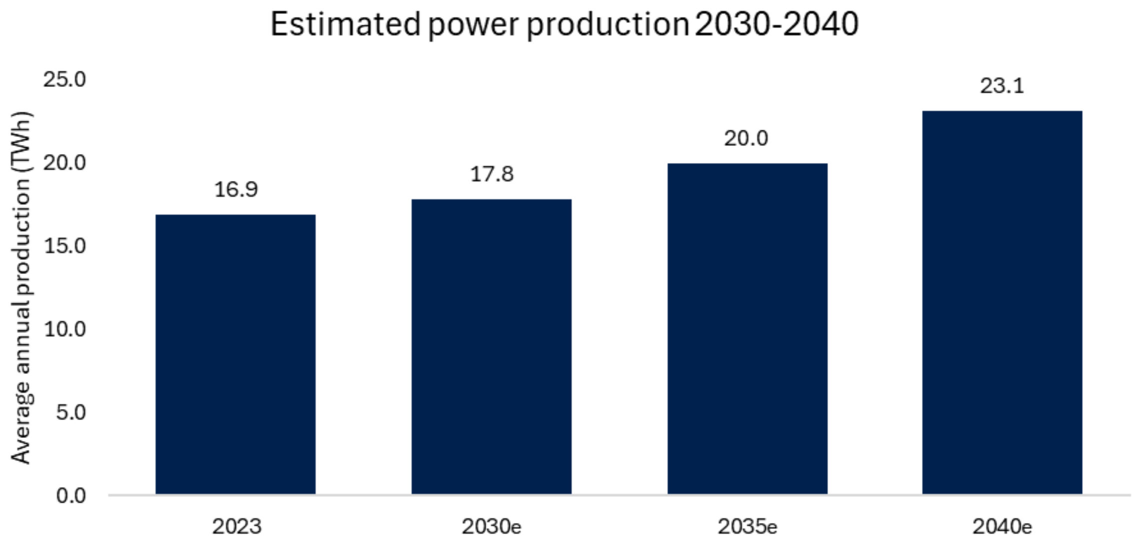

Figure 2 - NVE's estimated power production in 2030-2040 (TWh). Source: NVE

Another factor contributing to uncertainty in NVE's power production estimate is the impact of structural limitations, or bottlenecks, in the power grid. Norway is divided into five price areas, as shown in Figure 3. Statnett defines these areas based on bottlenecks in the power grid (Statnett, 2024a). Such bottlenecks can lead to price differences between areas, making some price areas more attractive for wind power investments than others. Without an increase in grid capacity, these price areas will persist. This will harm investments in regions with less favorable price conditions. The five price areas are Southeast Norway (NO1), Southwest Norway (NO2), Central Norway (NO3), Northern Norway (NO4), and Western

Norway (NO5). Figure 3 further illustrates the uneven distribution of wind power production across these regions, with approximately 8% of installed capacity in NO1, 28% in NO2, 42% in NO3, and 23% in NO4. Notably, NO5 is the only price area without onshore wind power installations (NVE, 2024c).

Figure 3 - Price areas and share of wind production coming from each price area. Source: NVE, Statnett

2.2 Ownership and market players

Figure 4 shows the distribution of ownership in Norwegian wind power production as of December 2023. The graph reveals that foreign ownership accounted for approximately 67%. Around 23% were publicly owned, and 10% had Norwegian private owners (NVE, 2024d). This suggests that Norway has historically been an attractive destination for foreign investment in renewable energy. However, the high proportion of foreign ownership also exposes the sector to potential vulnerabilities. A reliance on foreign investors means that changes in perceived risks, such as political instability or regulatory uncertainty, could prompt foreign investors to withdraw their capital from the Norwegian market.

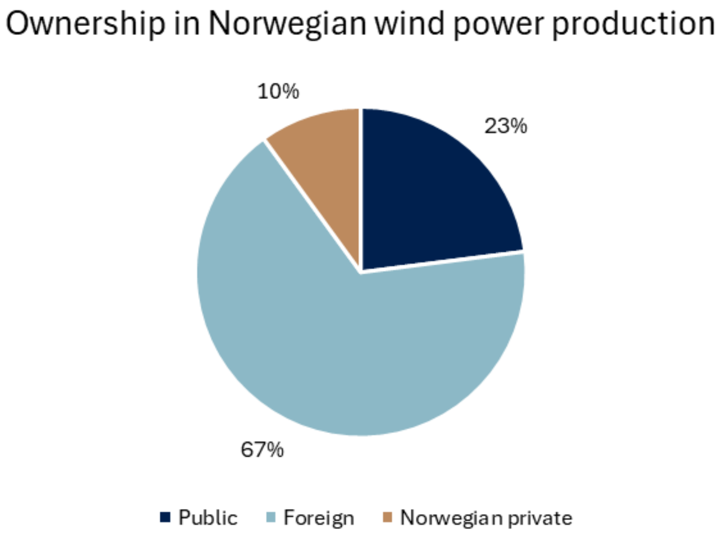

Figure 4 - Ownership in Norwegian wind power production. Source NVE

Figure 5 provides an overview of the ownership of Norway's largest wind power producers. Statkraft, a Norwegian state-owned company, is the largest wind power producer with an annual normal production of 2.0 TWh. This accounts for 12% of the normal annual wind power production in Norway. Following Statkraft are Hyfe Holding and Stadtwerke München.

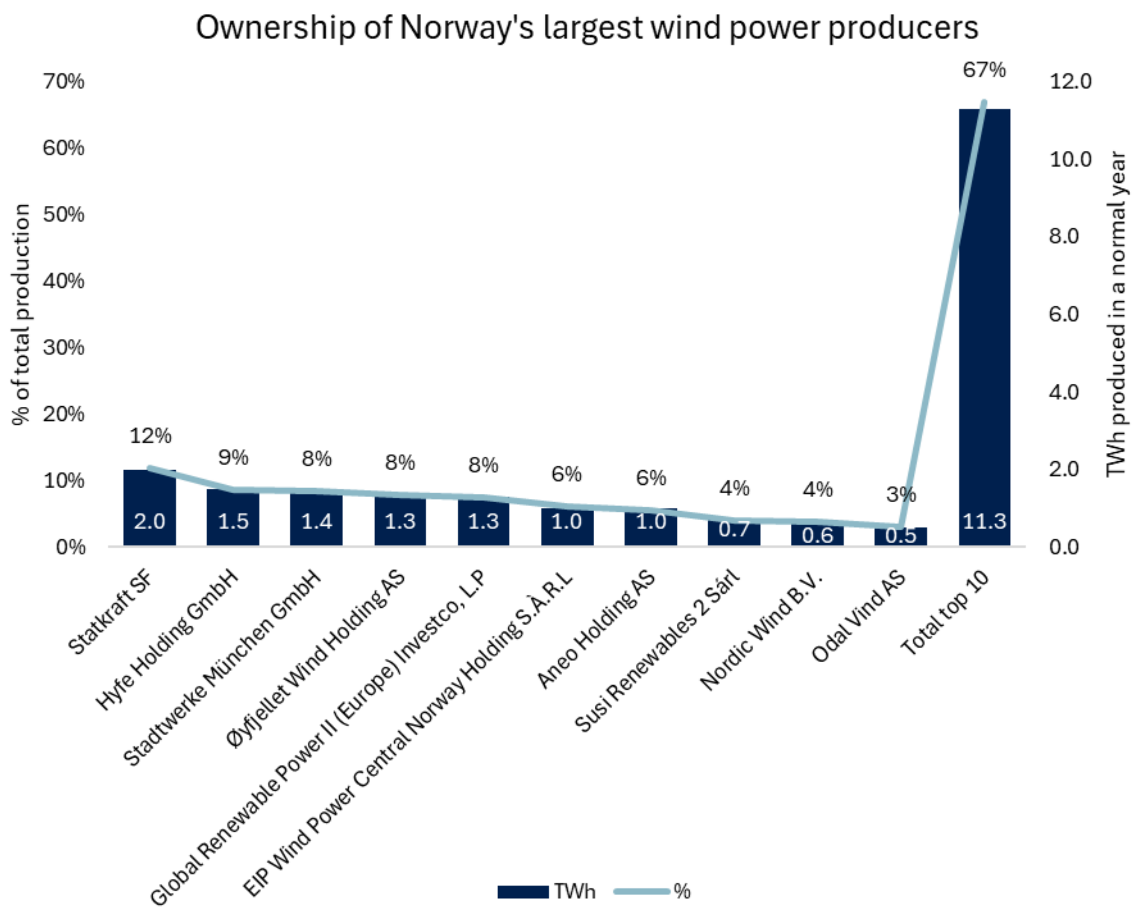

Figure 5 - Ownership of Norway's largest wind power producers. Source: NVE

2.3 Price and cost development

The profitability of the wind power industry is heavily dependent on the investment cost, load factor, and power price. Levelized Cost of Energy (LCOE) is a commonly used metric that refers to the average cost of producing energy over the entire lifetime of a power plant. It is calculated by dividing the total estimated costs of building, operating, and maintaining the plant by the total amount of energy it is expected to generate during its economic lifespan. Figure 6 illustrates the development of the LCOE for onshore wind in Norway from 2010 to 2022. After a gradual decline from 2019, the LCOE reached 41 øre/kWh in 2022 (NVE, u.d.). This was driven by increased production per installed capacity and/or lower costs per installed capacity. The decline in LCOE improves the cost-competitiveness of onshore wind, making it an increasingly attractive option in the energy mix.

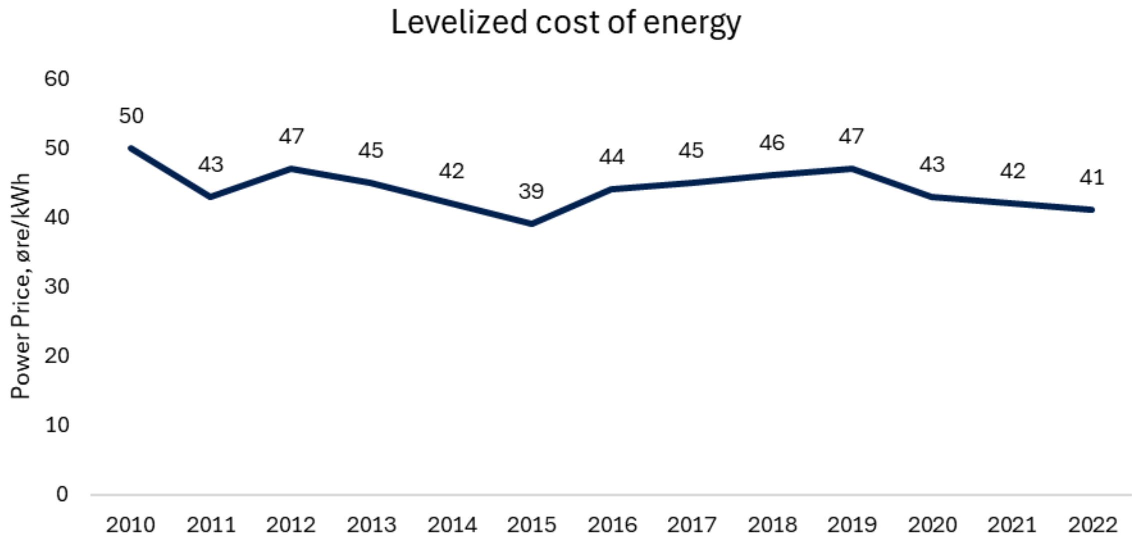

Figure 6 - Levelized cost of energy (2010-2022). Source: Statistics Norway, NVE

Comparing onshore wind with its alternatives, Figure 7 shows that onshore wind currently has the second-lowest LCOE among all energy sources. The low LCOE makes onshore wind one of the most attractive energy sources compared to offshore wind, solar power, and fossil fuels. By 2040, the LCOE of onshore wind is expected to decrease to 34.2 øre/kWh (NVE, 2023b), further improving its attractiveness. The low LCOE underscores onshore wind's potential to be a cornerstone of future affordable power production in Norway. However, for this potential to be realized, other factors must also be considered attractive, including the political frameworks.

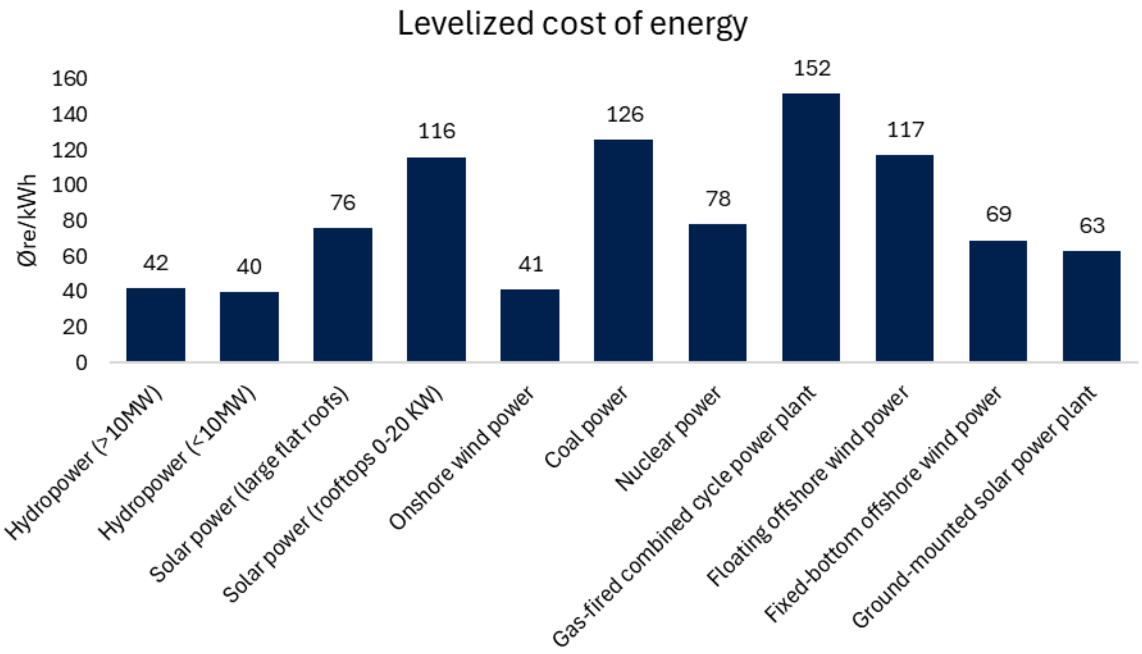

Figure 7 - Comparison of levelized cost of energy between different energy sources. Source: NVE

The declining LCOE strengthens the economic case for onshore wind, but its profitability ultimately depends on electricity prices. Figure 8 shows the price of electricity futures (øre/kWh) traded on Nasdaq OMX. Projections for the Norwegian price areas indicate that prices will remain relatively low compared to the high levels in 2021 and 2022 (Nasdaq OMX, 2024). The figure also shows that price disparities between the price areas are expected to persist through at least 2027.

Year	NO1 (Oslo)	NO 2 (Kristiansand)	NO3 (Trondheim)	NO4 (Tromsø)	NO5 (Bergen)
2025	57.57	64.64	33.35	31.64	55.51
2026	56.28	65.11	35.95	30.94	55.10
2027	58.63	65.41	41.07	37.18	57.45

Figure 8 - Future prices for electricity in the different price areas at 30.09.2024 (øre/kWh). Source Nasdaq OMX

Looking ahead to 2030, Figure 9 illustrates the power price projections from NVE's *Long-term Power Market Analysis 2023*. NVE's projections suggest that the current price disparities between Norway's price areas will gradually diminish by 2030, with prices in NO1, NO2, NO3, and NO5 at approximately 80 øre/kWh and NO4 slightly lower at 75 øre/kWh. The price estimates are higher than in previous analyses due to expected increases in fuel and CO_2 costs, as well as a tighter power balance in 2030. Figure 9 further illustrates that by 2040, the price disparities are expected to be nearly eliminated, with electricity prices stabilizing around 50 øre/kWh across all price areas. The decline in power prices reflects a stronger power balance in Norway and increased renewable energy integration across Europe.

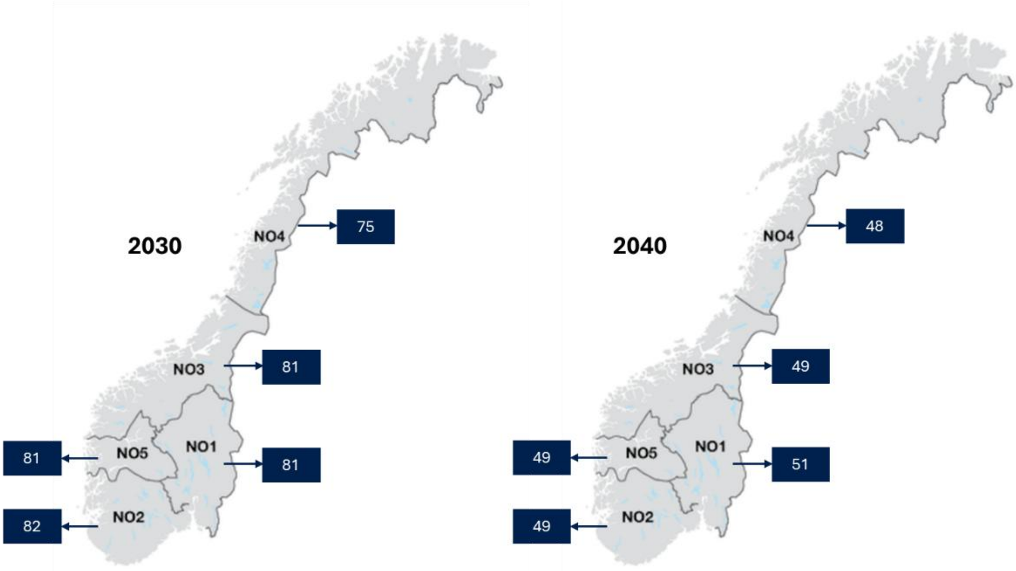

Figure 9 - Outlook for the power prices (øre/kWh) in the different price areas. Source: NVE

2.4 Additional income streams

In addition to electricity sales, power producers generate revenue from the sale of green certificates and guarantees of origin. The green certificate scheme awards tradable certificates to renewable energy producers for every MWh of electricity they generate, as long as their facility was operational by December 31, 2021 (NVE, 2023a). These certificates can be earned for up to 15 years from the year the facility was enrolled in the scheme. Demand for certificates is driven by a requirement for electricity suppliers to purchase certificates corresponding to a specific share of the electricity they sell. This allows producers to earn additional income through certificate sales. The cost of the scheme is passed on to electricity consumers through their electricity bills.

Figure 10 illustrates the price development of green certificates since 2004. While prices fluctuated, they remained relatively high until 2020. At current price levels, the additional income from green certificate sales is negligible. For a standard 50 MW wind farm with an annual production of approximately 170 GWh, income from green certificate sales would amount to around NOK 0.9 million per year. This represents 0.7% of total revenue, assuming a power price of 80 øre/kWh. However, at its peak of NOK 250/MWh, green certificates would have accounted for approximately 25% of total revenue.

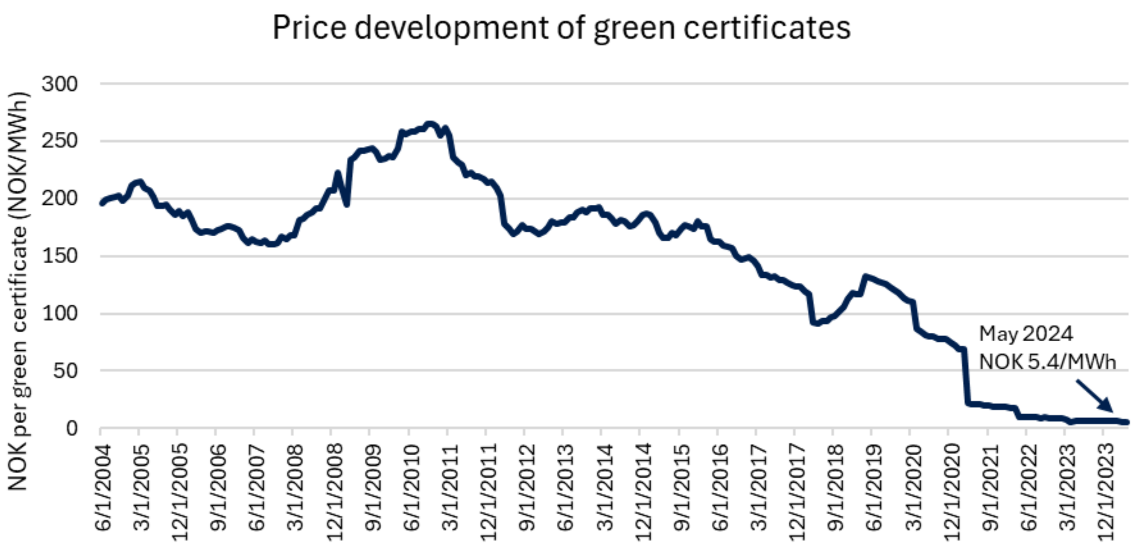

Figure 10 - Price development of green certificates. Source: NVE, Energimyndigheten

The Guarantee of Origin (GO) scheme is a voluntary European certification system for electricity, designed to assure consumers that a specified amount of energy has been generated from a particular source. This scheme allows consumers to purchase guarantees that renewable energy has been produced in an amount equivalent to all or part of their electricity consumption. For renewable energy producers, this provides an additional revenue stream. The income from GOs fluctuates annually, influenced by both renewable energy production levels and the demand for these guarantees.

2.5 Nordics

This subchapter provides an overview of the onshore wind market in the Nordic region.

2.5.1 Sweden

In 2023, Sweden's wind power production reached approximately 34 TWh (equal to the consumption of 1,700,000 Norwegian households). This was generated from 5,479 wind turbines and accounted for 21% of Sweden's total power production for the year (Energimyndigheten, 2024). By 2027, wind power production is expected to increase in the range of 41.9 to 55.1 TWh (Svensk Vindenergi, 2024). According to a Rystad Energy report, the installed effect in 2030 will be 30 GW (Rystad Energy, 2022)

Swedish onshore wind farms are mainly owned by foreign investors. Following the commissioning of all wind farms scheduled for completion in 2024, foreign ownership is expected to reach 66% (BayWa r.e., n.d.). This suggests that Sweden is an attractive investment destination for foreign capital. Overall, private companies own 76% of the wind farms, while industrial entities and large electricity consumers hold 3%. The Swedish state or municipal organizations account for 9% of the ownership, and foreign state-owned companies control the remaining 12% (Svensk Vindenergi, 2024).

2.5.2 Denmark

In 2023, Denmark's total onshore wind power production was 10.97 TWh (equal to the annual consumption of 550,000 Norwegian households). This production was generated from 6,236 onshore wind turbines (Fernandez, 2024). Onshore wind energy accounted for 29.8% of Denmark's energy production (Fernandez, 2024; Low Carbon Power, 2024).

A report published by Rystad Energy projected that Denmark's installed onshore wind capacity would increase by 11.5 GW by 2030, bringing the total capacity to approximately 16.3 GW (Rystad Energy, 2022).

Since 2009, Danish legislation has required that the local community holds 20% ownership in new wind projects (IEA, 2023). This measure aims to foster local acceptance by involving communities as active stakeholders in the wind farms that affect them.

2.5.3 Finland

In 2023, Finland's wind power production reached 14.5 TWh, with onshore wind accounting for 18.1% of the country's total energy production (IEA, 2024). This output corresponds to the yearly energy consumption of approximately 725,000 Norwegian households. According to Rystad Energy, Finland's installed wind power capacity is expected to increase from 6.9 GW to 20 GW by 2030 (Rystad Energy, 2022; Renewables Finland, 2024).

Ownership of Finland's wind power capacity is concentrated among 13 major stakeholders. Collectively, these players own 91% of the installed capacity. As of 2022, the distribution of ownership between foreign and domestic investors was relatively balanced, with foreign investors holding a 53% share and domestic investors holding 47% (Finnish Wind Power Associaton, 2023).

3. Resource rent in the onshore wind industry

3.1 Introduction to resource rent

Resource rent is the income from exploiting a natural resource that remains after all necessary input factors have received their market-based remuneration. In other words, resource rent represents the surplus income gained from having access to a natural resource, or what is earned beyond what would normally be gained by investing real capital and labor in other industries.

There are several reasons why natural resources can generate positive resource rent. The main explanation is that natural resources are limited in supply (Brekke, Lone, & Rødseth, 1997). This scarcity allows for sustained positive profits without new competitors entering the market. In other words, the limited availability prevents free competition, which would otherwise drive profits down toward normal capital returns.

Statistics Norway (SSB) has on several occasions calculated the resource rent in Norway's natural resource industries for the Ministry of Finance. In the latest report, *Ressursrenten i naturressursnæringene i Norge 1984-2022*, they calculate the resource rent as shown in Figure 11. First, the value of electricity production is calculated by multiplying the hourly production by the corresponding spot price for each hour in the price area where the electricity is generated. Operating costs, depreciation, and the normal return on real capital are deducted. SSB uses two different assumptions for the required rate of return, 4% and 7%.

Derivation of the calculation of resource rent in the wind power industry
Production value
- Operating costs (Labor and material inputs)
- Depreciation
- Normal return on real capital
=Resource rent

Figure 11 - Calculation of resource rent. Source: Statistics Norway

3.2 Resource rent from 2018 to 2022

Figure 12 shows the resource rent from 2018 to 2022 when applying a 4% and 7% discount rate. We can see that the resource rent was negative from 2018 to 2021 and positive in 2022 when a rate of 7% was applied. When a rate of 4% is used, the resource rent was negative from 2018 to 2020 and positive in 2021 and 2022 (Dalen, Greaker, & Hagem, 2023). The figure shows that the resource rent was particularly negative in 2020. This was driven by historically low electricity prices that year. In contrast, electricity prices were unusually high in 2022, leading to a significant increase in the resource rent for the wind power industry that year.

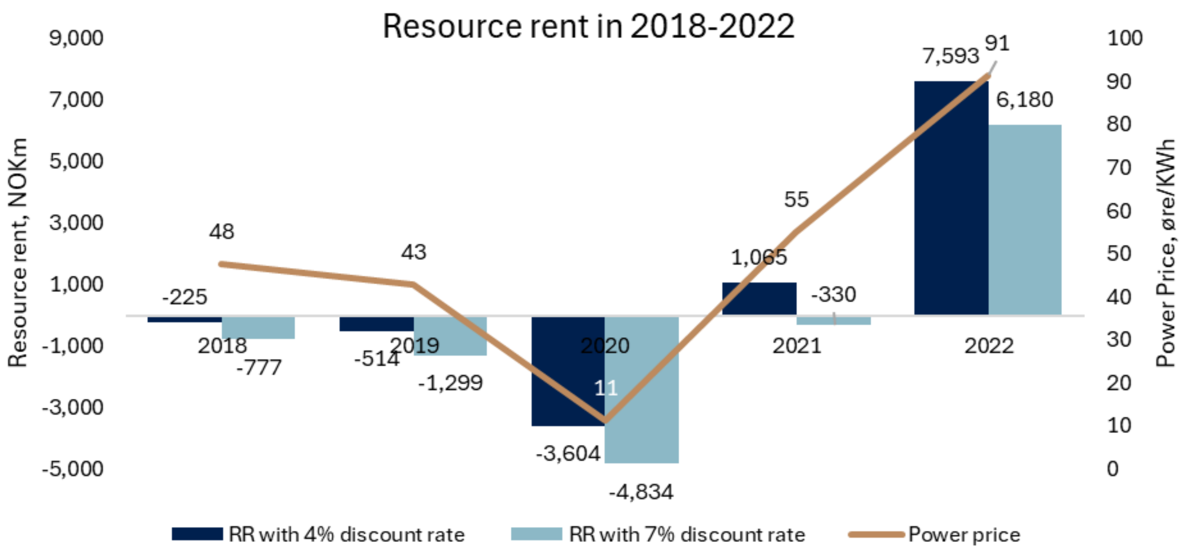

Figure 12 - Resource rent in 2018-20222 when a discount rate of 4% and 7% is applied. Source: Statistics Norway

The resource rent is further analyzed in Figure 13, which shows a decomposition of the resource rent from 2018 to 2022, based on a discount rate of 4%. From the figure, we can see that the increase in production value has the most significant impact on the resource rent. Notably, the average price of wind power in 2022 was nearly nine times higher than in 2020.

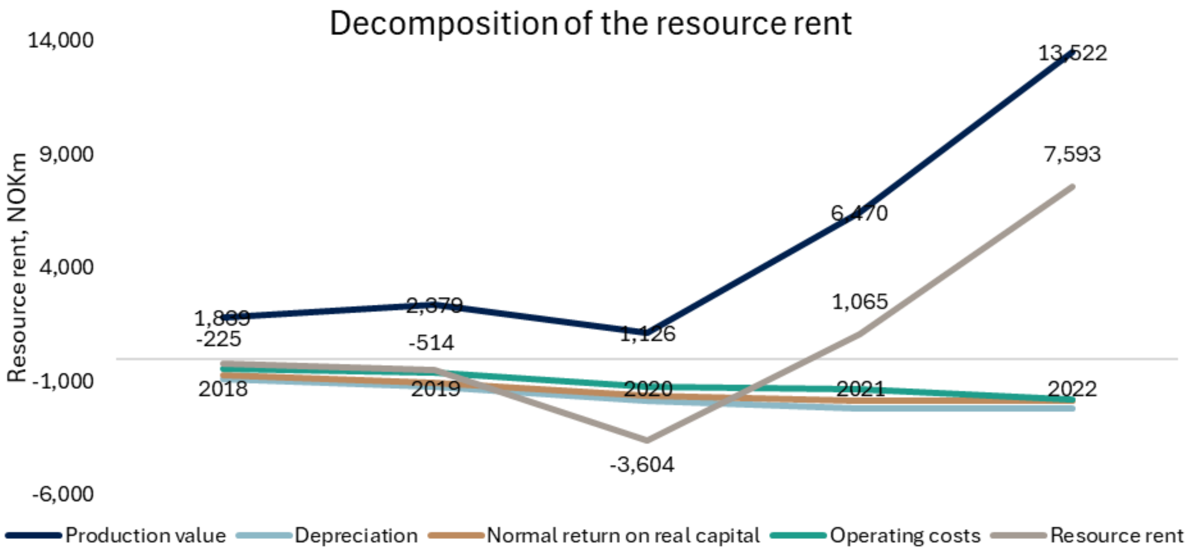

Figure 13 - Decomposition of the resource rent in 2018-2022 with a discount rate of 4%. Source: Statistics Norway

3.3 Power purchase agreements

Wind power is often sold through long-term Power Purchase Agreements (PPAs), where the producer receives a predetermined price for their power production. The purpose of these agreements is to mitigate price risk for both the buyer and the seller. By securing a fixed electricity price, the wind power producers' cost of capital can potentially be reduced, and the conditions for debt financing can be improved (Ministry of Finance, 2023). On the other hand, PPAs limit the ability to benefit from high market prices and reduce the wind producer's flexibility. As such, PPAs represent a trade-off between stability and certainty in revenue versus the potential for higher earnings. Wind power producers evaluate this trade-off based on their risk tolerance and market expectations.

Approximately 50% of wind energy is sold through PPAs lasting between 10 and 25 years, with prices around 30 øre per kWh (KPMG, 2023). Thus, the producers' actual resource rent deviates from the resource rent calculated based on spot prices. Figure 14 illustrates this by comparing the resource rent calculated using only spot prices with the resource rent calculated by combining spot prices and PPAs at a fixed rate of 30 øre/kWh. The discount rate used in these calculations is 4%.

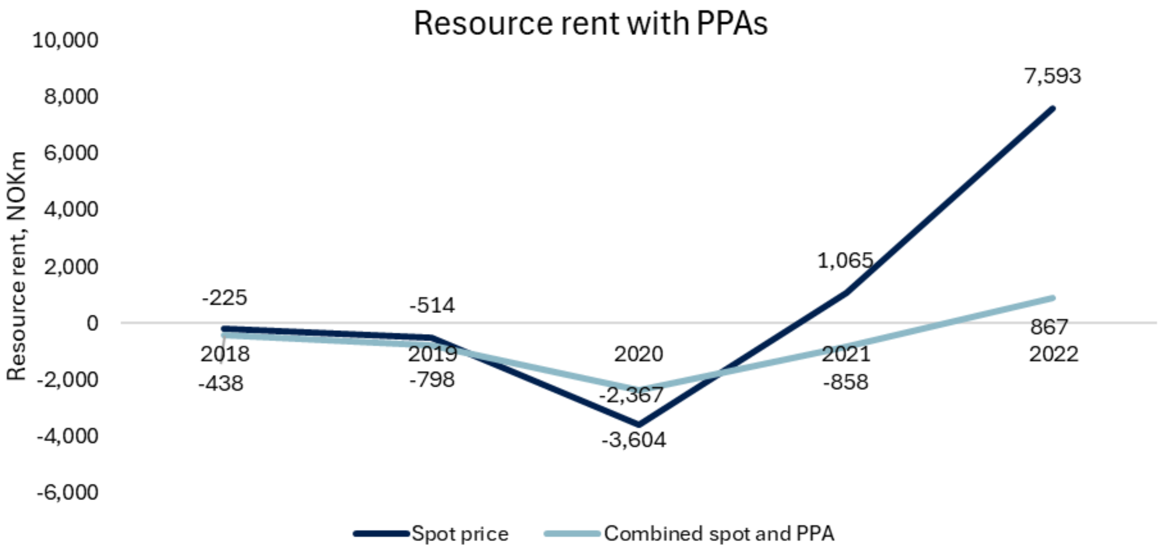

Figure 14 - Resource rent in 2018-2022 when including PPAs. Source: Statistisk Sentralbyrå

In 2020, the spot price for electricity was remarkably low, averaging just 10 øre/kWh. As shown in Figure 14, earnings were generally higher for producers with PPAs compared to those relying solely on the spot market. However, in other years, the earnings from PPAs were lower than what could have been achieved in the spot market. The difference is especially significant in 2022 when electricity prices were unusually high. From Figure 14 we can see that 2022 was the only year that power producers with PPAs had a positive resource rent. The portion of resource rent that does not go to wind power producers benefits those who purchase electricity at a price lower than the spot price.

It is also worth noting that power producers earned significant revenue through the electricity certificate market in 2018 and 2019, ranging from around 5 øre to over 20 øre per kWh. Toward 2020, electricity certificate prices dropped sharply and have remained close to zero since 2020. Power producers have also earned income from selling Guarantees of Origin. None of these revenues are included in the data presented in Figure 14.

4. Survey

4.1 Survey approach and motivation

This research includes responses from a survey sent to onshore wind companies and renewable energy analysts. The survey aimed to investigate market participants' perspectives on the financial impacts of the resource rent tax on future investments and its consequences. Additionally, we aimed to assess whether market participants' perspectives align with theoretical predictions on how taxes and political uncertainty influence investment behavior.

4.2 Survey design and distribution

The survey was designed through Qualtrics and distributed to companies and analysts via email. Targeted respondents included wind farm developers, domestic and international investors, and other relevant market participants. By gathering responses from both domestic and foreign investors, the survey aimed to capture a broader view of the impact of the tax on Norway's attractiveness as an investment destination. Additionally, the survey targeted renewable energy analysts from every investment bank in Norway.

The survey received responses from six companies and five analysts. While this sample size gives trustworthy viewpoints, it is important to acknowledge a potential source of bias in responses. The most engaged and affected companies are likely the ones who chose to respond. This may have influenced the overall sentiment captured in the survey results. Furthermore, the small sample size limits the extent to which the findings can represent broader industry opinions.

4.3 Theoretical foundation

The real options theory provides a framework for understanding how political uncertainty influences investment decisions. Real options theory suggests that when uncertainty is present, firms may delay investment to preserve flexibility and wait for additional information (Jahn & Sticker, 2022). The delay occurs when the value of waiting exceeds the cost of idle capital. As a result, firms are more likely to postpone market entry and, in some cases, exit the market altogether if uncertainty persists (Jahn & Sticker, 2022).

Empirical evidence from other markets confirms these predictions. A study conducted in the United States found that heightened political uncertainty, particularly in the context of policy debates, created an unfavorable investment climate (Sims, 2024). The study revealed that a 1% increase in policy uncertainty led to a 0.1% decline in investment across several sectors, including the energy sector. In the pre-election period leading up to the 2008 U.S. presidential election, investment levels dropped by 25% due to increased political uncertainty (Sims, 2024).

4.4 Responses

4.4.1 Market entry and exit

We asked respondents whether the resource rent tax would deter market entries and lead to market exits. The findings are summarized and will be referenced throughout the remainder of the thesis, and discussed in Chapter 8.2

To assess the perceived impact on market entries, we asked: *Do you think the resource rent tax will deter new entrants from entering the market?* Eight respondents answered yes, one responded potentially, and two answered no.

To assess the impact on market exits, we asked: *Do you think the resource rent tax will cause existing players to exit the market?* Nine respondents were certain, one considered it possible, and one disagreed.

We also examined potential spillover effects, specifically whether the tax might shift investment preferences from onshore to offshore wind projects. To investigate this, we asked*: Do you think the resource rent tax will encourage a shift towards developing offshore wind*? Seven respondents believed the tax would not encourage a shift toward offshore wind, citing the perceived risk of a similar tax being imposed on offshore wind projects. Two respondents also answered no but provided no further explanation. One respondent stated potentially, while another answered no, noting that offshore wind is not currently profitable.

4.4.2 Cost of capital

We also asked analysts and companies about the discount rates they apply when evaluating onshore wind projects. Specifically, we inquired: *What range does the discount rate you use* *for onshore wind power projects fall within?* The responses are shown in Figure 18. The responses indicated a range of 6-10%.

5. Taxation

The purpose of the tax system is to generate revenue for the government, enabling funding of public services like education and healthcare. Norway relies on a large public sector and extensive publicly funded benefits. To maintain this, a high level of tax income is necessary. A well-designed tax system minimizes disruptions to efficient resource allocation and reduces economic inefficiencies.

In an economy with an efficient resource allocation, the consumers and producers adapt to an equilibrium, called a Pareto optimality (Ingham, 2024). This chapter will discuss how taxes affect efficient resource allocation and begins with a short explanation of Pareto optimality.

A situation is considered Pareto-optimal if, and only if, there is no alternative allocation of resources that could improve someone's well-being without making anyone else worse off (Ingham, 2024). To achieve this, three conditions must be met. First, there must be production efficiency, where the input factors used in producing a given quantity of goods are limited to only what is strictly necessary. Second, there must be efficiency in consumption, meaning that given the total availability of goods, it should not be possible to improve the welfare of one consumer without simultaneously worsening the welfare of another. Third, production must align with consumer preferences, ensuring that the value consumers place on a good corresponds to the opportunity cost of its production, reflected in the reduced availability of alternative goods.

The first main result of welfare economics is that a competitive equilibrium leads to a Pareto-optimal allocation of resources (Ingham, 2024). In a market economy without taxes or market failures, profit-maximizing firms adjust their investments and production to maximize profits. When all firms in a market follow this behavior, societal welfare is also maximized (Blaug, 2007).

Sandmo (NOU 1989: 14) highlights that the conditions for achieving Pareto-optimal resource allocation are so abstract and detached from real-world market conditions that they are challenging to use as practical guidelines for defining efficiency. Instead, the competitive equilibrium model is more suitable as a practical ideal for efficiency. Sandmo also acknowledges that this model, while closer to actual market behavior, remains an abstraction and may conflict with the restrictive assumptions previously mentioned. Nevertheless, it provides a helpful framework for evaluating efficient resource allocation.

Based on these considerations, this discussion assumes that efficient resource use is achieved under perfect competition when analyzing the effects of various tax policies.

5.1 Different types of tax

5.1.1 Distortionary taxes

Taxes are designed to be as minimally intrusive as possible. However, in many cases, they influence the actions of individuals and companies in some way. This creates a distortionary effect, causing businesses and individuals to make decisions they might not have made otherwise. A distortionary tax violates the conditions for social efficiency (Christiansen, 2022). From a corporate perspective, this may lead to either overinvestment or underinvestment in activities affected by the distortionary tax and an efficiency loss.

5.1.2 Neutral taxes

The counterpart to distortionary taxes is neutral taxes, meaning they avoid altering consumer or company behavior. This is an ideal type of tax, as it does not result in a deadweight loss.

If a company plans to invest in a project, the introduction of a neutral tax will not change the investment decision for the given project. If the project was profitable before the implementation of the tax, it should remain profitable even after the tax is introduced. In this case, if a company is planning to invest in a wind farm, a neutral resource rent tax should in theory not influence this investment decision.

5.2 Theoretical guidelines for tax design

When designing taxes, the tax authorities follow a set of concepts and principles aimed at minimizing socioeconomic costs. In Norway, these principles are outlined in *Innst. 273S (2015-2016)* and have strongly influenced tax policy since the tax reform in 1992.

A common principle is that tax policy should prioritize neutral tax options before considering distortionary ones. This is to reduce the socioeconomic costs of taxes in general

(NOU 1989: 14). Distortionary taxes should only be introduced after all options for implementing neutral taxes have been fully explored, to secure sufficient funding for public goods (*Innst. 273S (2015-2016).*

A key principle is that taxes should remain neutral, regardless of ownership structure or type of investment, across all industries. This approach helps ensure that capital flows to the most profitable projects, minimizing the efficiency losses associated with taxation.

Additionally, principles such as broad tax bases, low rates, and equal treatment of income and expenses have been central since the 1992 tax reform. Broad tax bases, which include all types of income, are crucial for ensuring equal taxation for individuals with similar incomes and for promoting a fairer distribution of wealth (*Innst. 273S (2015-2016)).* Low taxes and equal treatment of income are crucial for making Norway attractive to both domestic and foreign investors, ensuring it remains competitive with other economies.

Summarized, Norway's tax system prioritizes balancing revenue generation with minimizing economic inefficiencies. By emphasizing neutral taxes, broad tax bases, low rates, and equal treatment of income and expenses, tax policy aims to reduce socioeconomic costs while promoting fairness and competitiveness. This approach reflects a commitment to efficiency, equity, and fiscal sustainability.

5.3 Resource rent tax on a tax basis

To enhance an efficient tax system, it is recommended to minimize distortionary taxes and maximize neutrally designed resource rent taxes (Lund, 2009). Resource rent taxation focuses on taxing only the resource rent while allowing investors to retain sufficient returns to justify their investments. This approach creates a neutral tax base, enabling the redistribution of resource rents derived from the limited access to natural resources.

As discussed in Chapter 2, Norwegian onshore wind has a high level of foreign ownership. Implementing a resource rent tax ensures that the financial benefits from exploiting natural resources remain within the country. For businesses owned by foreign investors, the resource rent tax acts as a source-based taxation (NOU 2022: 20). This serves as a strong argument in favor of resource rent taxation, strengthening public support for its implementation.

A key argument for implementing a resource rent tax is its potential to be designed neutrally. Properly designed, the tax targets only the resource rent itself, without distorting investment decisions or corporate behavior. In theory, a neutral resource rent tax could have a rate as high as nearly 100% without influencing companies' investment choices or operational behavior (NOU 2000:18).

5.3.1 Neutral resource rent tax

In this chapter, we will outline different approaches to designing a resource rent tax and how to structure it to ensure tax neutrality.

There are two primary models for collecting resource rent tax, the cash flow model and the carry-forward model. The cash flow model was introduced by Brown in 1945. In this model, the state acts as a passive investor, covering a share of the investment cost proportional to the tax rate. In return, the state receives a corresponding share of the profits (Brown, 1945). From the perspective of private investors, the investment cost is effectively reduced by the state's contribution, ensuring the IRR remains unchanged. This design aims to ensure that investment decisions are unaffected by the implementation of a resource rent tax.

During the construction and early operational phases of a wind farm, expenses exceed revenue, resulting in negative gross resource income. Under Brown's model, the state compensates for this by directly paying out the amount of the negative resource rent tax (Brown, 1945). To achieve tax neutrality, the tax rate applied to investment deductions must equal the rate applied to future income. This requires a stable tax regime with a consistent tax rate (NOU 2022: 20). This principle is supported by Bonds and Devereux (1995), who state that “the tax must treat taxable profits and losses symmetrically, and the tax rate must be a known constant, even in the special case when the tax base coincides with the economic rent earned in each” (Bonds & Devereux, 1995).

The carry-forward model was first introduced by Garnaut and Ross (1975) and later generalized by Boadway and Bruce (1984). Under this model, negative cash flows are carried forward to future periods and increased by accrued interest to reflect the time value of money. It can then be deducted against positive cash flows in subsequent periods. If future taxable income is sufficient to utilize the carried-forward amounts fully, the tax system effectively ensures that only the resource rent is taxed (Lund, 2009).

For this model to remain neutral, the carry-forward interest rate must equal the investors' cost of capital. This requires that the carry-forward rate incorporates both the risk-free interest rate and a risk premium reflective of what investors face in the market. If this rate is determined appropriately, investors would, in principle, remain indifferent between a carry-forward tax and an immediate payout (Lund, 2009).

A drawback with the carry-forward model arises when there is uncertainty regarding the existence or realization of resource rent. This is particularly relevant for onshore wind, as discussed in Chapter 3. Without guaranteed future resource rent, the tax system becomes asymmetric. Realized net value is reduced when returns are positive, but negative outcomes are not compensated (Garnaut & Ross, 1979). This asymmetry can make the carry-forward tax distortive (Mayo, 1979).

6. Resource rent tax framework for onshore wind

A well-designed resource rent tax model can increase tax revenue from wind power and natural resources without reducing or distorting investment activities. This chapter analyzes *Lovvedtak 36* and Chapter 18 of the *Skatteloven*. These legislative measures are based on the government proposal *Prop. 2 LS (2023–2024)* and the Finance Committee's recommendation, *Innst. 124 L (2023–2024).* The chapter also provides a comprehensive review of the tax's key components.

Before introducing the tax, it is essential to clarify the rationale behind the resource rent tax on onshore wind. The Norwegian Tax Administration argues that wind power exploits valuable natural resources to generate profit, and these profits should be taxed to ensure that a fair share of the value derived from Norway's natural resources benefits the broader society (Skatteetaten, 2024)

6.1 Tax model

The resource rent tax applies to wind farms with an installed capacity of 1 MW or higher. Additionally, wind farms consisting of five or more turbines are also subject to the tax (Skatteloven, 1999, § 18-10-10). This means that smaller, on-site wind farms are exempt. The resource rent tax is limited to onshore wind farms and does not apply to offshore wind farms.

Each wind farm is taxed individually, meaning losses cannot be transferred between wind farms, even if they share the same owner. Several factors must be considered to define what constitutes a single wind farm, including whether the areas form a unified planning zone and share infrastructure such as roads and grid connections (Skatteloven, 1999, §18-10). Ownership may also influence whether multiple installations are regarded as one wind farm.

The resource rent tax rate is determined annually by the Norwegian Parliament (Skatteloven, 1999, § 18-10). For 2024, it has been set at 32.1%. However, after deductions, the effective tax rate is 25%, which is 10% lower than the suggested 35% in the proposition from the government (Innstl 124, 2023). Furthermore, once the tax is calculated, the power production fee can be deducted from the resource rent tax. Figure 15 shows a simplified calculation of the resource rent.

	Calculation of resource rent
+	Revenue
+	Gains from the disposal of fixed assets
+	Subsidies for new power prodcuction
+	Income from electircity certificates
+	Income from guarantees of origin
=	**Gross resource rent income**
-	Operating expenses
-	Property tax on power plants
-	Depreciation of fixed assets (investments before 2024)
-	Interest on deferred deductions (compensation for investments made before 2024)
-	Costs incurred during the construction period
-	Investment costs from 2024 onwards that would otherwise be subject to capitalization
-	Special calculated corporate tax
=	**This year's resource rent income**
×	Tax rate (32.1%)
=	**Resource rent tax**
-	Production fee
=	**Resource rent tax payable**

Figure 15 – Calculation of the resource rent income

6.2 Income §18-10

This chapter explains the components of calculating the gross resource rent income, which forms the basis for the resource rent tax before accounting for any deductible costs.

6.2.1 Spot market as a general rule

Gross resource rent income for wind power facilities is based on the hourly electricity production multiplied by the corresponding spot market price determined by Nord Pool AS (Skatteloven, 1999, §18-10-4). This approach ensures that the income reflects the real-time market value of electricity produced, providing an accurate basis for assessing profitability under standard market conditions.

6.2.2 PPAs as an exception

Approximately 50% of wind power is sold through long-term contracts called Power Purchase Agreements (KPMG, 2023). To ensure fair taxation of income from power production, exceptions are made for specific PPAs. These include agreements signed before September 28, 2022, long-term fixed-price contracts with suppliers sold under standard fixed-price agreements to end users, and purchase agreements entered during 2024–2030 (Skatteloven, 1999, §18-10-1a).

In cases where these contracts are terminated early, any resulting gains or losses are included in the gross resource rent income calculation. This method accounts for the contractual terms while avoiding distortions caused by fluctuating spot market prices, ensuring a fair and accurate valuation of total income.

6.2.3 Income from electrical certificates and guarantees of origin

In addition to income from electricity production, wind power producers can earn revenue from selling electricity certificates and guarantees of origin. To ensure that the resource rent tax is neutral, all related income and costs must be included in the tax calculation (Skatteloven, 1999, §18-10-2 (c, d)).

6.2.4 Income from the sale of operating assets and subsidies

Gains and losses from the sale of assets used in wind power operations should be included in or deducted from the resource rent income. This applies to both depreciable and non-depreciable assets, ensuring that all relevant financial outcomes from asset transactions are reflected in the calculation of the resource rent. Different aids and subsidies will also be included in calculating the gross resource rent income.

6.3 Deductions

This chapter outlines the key deductions allowed under the resource rent tax, including operational expenses, corporate tax adjustments, and investment costs.

6.3.1 Operational expenses

In the consultation paper, the Ministry proposed that costs directly associated with wind power production should qualify as deductions from the resource rent tax. Operational expenses incurred up to the point where electricity is fed into the power grid are deductible. This approach ensures alignment with the recommendation to calculate taxable resource rent income based on the spot market prices of electricity delivered into the grid.

The deductible operational expenses outlined in §18-10-3a (Skatteloven, 1999) include wages and other personnel costs, maintenance costs, insurance, administration, compensation to landowners for lost income from business activities discontinued due to the establishment of a wind power facility and other production-related expenses directly tied to the power facility. However, certain expenses are explicitly excluded from deduction, such as acquisition costs for land, payments to landowners, municipalities, or similar entities, and costs related to sales, transfers, or financing.

For costs that are deductible but benefit multiple wind power facilities operated by the same taxpayer, the expenses must be allocated in a way that appropriately reflects the proportional benefit to each facility. Expenses that benefit both wind power production and other business activities conducted by the taxpayer must also be allocated to ensure alignment between cost distribution and benefit received for each activity (Skatteloven, 1999, § 18-10-3).

Under § 18-10-10 (Skatteloven, 1999), taxpayers are permitted to deduct feed-in costs and expenses for grid connection, provided the power is valued at the spot market price or the agreed price explicitly includes feed-in costs. Physical losses during transmission can also be deducted and calculated using a standard method based on the length of the transmission line and a set loss factor. This provides a clear way to account for costs related to feeding power into the grid.

6.3.2 Property tax

Property tax paid to the host municipality is deductible when calculating the resource rent. While the property tax rate is determined by the municipality, it cannot exceed 0.7% of the property value. 45 of the 46 municipalities that are hosting wind farms impose a property tax (NVE, 2024c)

6.3.3 Special calculated corporate tax

When calculating resource rent income, a special calculated corporate tax for wind power can be deducted from gross resource rent income. This calculation uses the same income and expense figures as the resource rent tax but requires the depreciation of operating assets to follow the general rules outlined in the tax law. In addition, the company can deduct property tax from the taxable income.

For assets acquired before January 1, 2024, the depreciation basis is determined as specified in letter a, no. 3 a. to c. Operating assets depreciated under §14-51 for ordinary income tax purposes use the same depreciation amounts, while adjustments under letter a, no. 3 b. and c. must comply with general tax law regulations (Skatteloven, 1999)

6.3.4 Investment costs

Deductions for investment costs in the resource rent income are treated differently depending on whether the investment was made before or after December 31, 2023. The cash flow tax applies for investments made on or after January 1, 2024, allowing the company to deduct the investment costs. Investments made before January 1, 2024, are deducted through depreciation with a risk-free rate to compensate for being unable to deduct immediately.

6.3.5 Investments made before January 1, 2024

In recent years, the depreciation rules for onshore wind power facilities have varied significantly. For instance, assets acquired between June 19, 2015, and December 31, 2021, were eligible for favorable rules, allowing linear depreciation over five years. This created a significant disparity between the remaining tax value under these favorable rules and the ordinary declining balance method by 2023. After extensive disagreement over handling this transition, it became clear that measures were needed to ensure fairness for existing facilities entering the resource rent tax system.

To address this, the government proposed that existing facilities, including those benefiting from favorable depreciation, should enter the resource rent tax system with an entry value calculated as if ordinary depreciation rules had always applied, as specified in § 18-10-3 a, no. 3 (Skatteloven, 1999). However, parliamentary negotiations led to a more generous compromise. Existing facilities can adjust their entry value by 40%, based on ordinary depreciation rules, and depreciate this value linearly over five years for resource rent tax purposes. The adjusted value cannot exceed 85% of the original cost of the operating assets.

6.3.6 Investments made after January 1, 2024

Starting January 1, 2024, investments in new wind farms are subject to the resource rent tax under a cash flow taxation model. This allows companies to immediately deduct investment costs when calculating resource rent, rather than spreading these costs over several years as is required under ordinary income tax rules.

To qualify for immediate deduction, the investment costs must be directly related to the operation of the wind farm. Eligible costs include depreciable and non-depreciable items, such as foundations, towers, wind turbines, cable systems, transformer stations, service buildings, access roads, and parking areas. However, certain costs are excluded from this immediate deduction, including the purchase of existing wind farms, land acquisition costs, and payments made to landowners, municipalities, or similar entities.

If investment costs result in negative resource rent income, the payment scheme allows for tax deficits to be paid out after the wind farm becomes operational and the Tax Administration has completed a tax assessment. Until the reimbursement is made, the negative resource rent tax is carried forward at a risk-free rate.

6.4 Payout scheme

In the government's original proposal, any losses under the resource rent tax are carried forward with a risk-free interest rate to offset future profits or paid out upon the closure of the business. It has now been proposed that the government reimburse companies for negative resource rent taxes. However, any negative resource rent that arises before a wind power facility is fully operational due to the immediate deduction of investment costs must still be carried forward with a risk-free interest rate until the facility becomes operational. The payout system for negative resource rent income is contingent on approval from ESA, as there are concerns that it might be classified as illegal state aid.

6.5 Risk-free rate

The interest rate applied under *Skatteloven* § 18-10, third paragraph, letter a, no. 4, fourth paragraph, seventh paragraph, letter a, and § 18-11 is determined annually. The rate is based on the average annual interest rate of 12-month treasury bills, adjusted to reflect the after-tax rate for ordinary income. The interest rate is rounded to the nearest tenth of a percentage point. This ensures that the carry-forward of negative resource rent is calculated using a consistent, market-based risk-free rate appropriately adjusted for tax effects (Skatteloven, 1999).

6.6 Production fee

The production fee of 2.3 øre/kWh is deductible when calculating the resource rent. This deduction is applied on a krone-for-krone basis, ensuring that the full amount of the production fee offsets the resource rent tax (Skattetaten, 2024). The revenues from the production fee are distributed proportionally among municipalities based on their share of total Norwegian wind power production.

7. Financial implications of the resource rent tax

The wind power industry stands as one of the pillars of Norway's transition to a low-emission society. As a renewable energy source with significant potential, investments in wind power are crucial for meeting national and international climate goals. At the same time, the introduction of a resource rent tax on wind power has raised questions about whether it prevents new investments in the sector. Under the current model, negative resource rent tax is carried forward, compounded at a risk-free interest rate, and deducted from taxable income once the company becomes profitable, rather than providing immediate payouts. This has prompted debate about how the tax model affects new projects with long timeframes before achieving profitability. These challenges are known from other resource rent tax models, where the need for reform has led to adjustments in how investments are treated to mitigate potential adverse effects of the tax system.

The resource rent tax is meant to ensure that society receives a fair share of the returns from natural resources without hindering new profitable projects from proceeding. This means that only the extraordinary return, known as the resource rent, is taxed, while a normal return to investors remains unaffected. Despite this intention, experiences from other industries, such as hydropower and petroleum, have shown that the treatment of negative taxes can have significant consequences for investment behavior. For wind power, this is particularly relevant because the sector is characterized by high capital intensity, long payback periods, and substantial risks related to market prices and regulations. Deferring negative taxes to future years reduces the net present value of investments, which can make marginally profitable projects unviable.

This chapter examines the financial implications of the resource rent tax. It will examine how the resource rent tax with and without payouts impacts the cash flow of new projects. The analysis further evaluates how IRR and NPV respond to varying tax rates, power prices, investment costs, and cost of capital.

7.1 Assumptions

The cash flows provided in this chapter are excerpts from a cash flow for a standard 50 MW wind farm. The assumptions are based on insights gathered from interviews with Cloudberry Clean Energy, Fred Olsen Renewables, Nordic Wind, and Eviny, supplemented with data published by NVE. Given the variations in estimates across these sources, a consensus approach was adopted to integrate and align the differing perspectives. Figure 16 shows the assumptions.

Assumptions	Measure	Parameter
Building time	Years	2
Life time	Years	30
Capacity	MW	50
Production	GWh	166
Load hours	Hours	3,329
Load factor	%	38%
Capture rate	%	97.0%
Lease	% of sales	4%
Opex	NOKm/GWh	0.13
Investment cost	NOKm/MW	14
Debt ratio	%	35%
Interest rate	NIBOR + 1.5% margin	6.2%
Loan term	Year	31
Risk-free rate	%	3.7%
Ordinary tax rate	%	22%
Resource rent tax rate	%	32.1%
Production fee	NOKm/GWh	0.023
Property tax	% of wind park value	0.5%
Declining balance depreciation rate group d	%	20%
Declining balance depreciation rate other groups	%	4%
Cost of capital	%	7.5%

Figure 16 - Key assumptions in the cash flow projections

The assumptions that are most sensitive to the internal rate of return (IRR) are load factor, investment cost, and power price. The load factor tells us how efficiently the wind turbine operates relative to its maximum capacity over a given period. A higher load factor indicates better utilization of the turbine, which increases the revenue. Most companies report a load factor between 35% and 40%. However, this ultimately depends on the location of the wind farm.

In Norway, power prices currently vary across different price areas. However, analysts project that these differences will nearly disappear by 2030 (Larsen, 2023). With no new onshore wind investments anticipated before then, wind farm companies can expect relatively similar power prices nationwide when new wind farms become operational. Consequently, our model assumes the same power price across all price areas.

Price development is highly uncertain and depends on numerous factors. The power price applied in this thesis is derived from NVE's estimates and adjusted for the capture rate. This adjustment is made as wind farms typically sell electricity at prices lower than the average market rate. The capture rate used is calculated based on historical averages provided by NVE and the Ministry of Finance (Ministry of Finance, 2023). Additionally, the analysis assumes that the capture rate will decrease by 0.005% annually from year 6, due to market cannibalization. Figure 17 shows the power price, the capture rate, and the realized power price applied in the analysis.

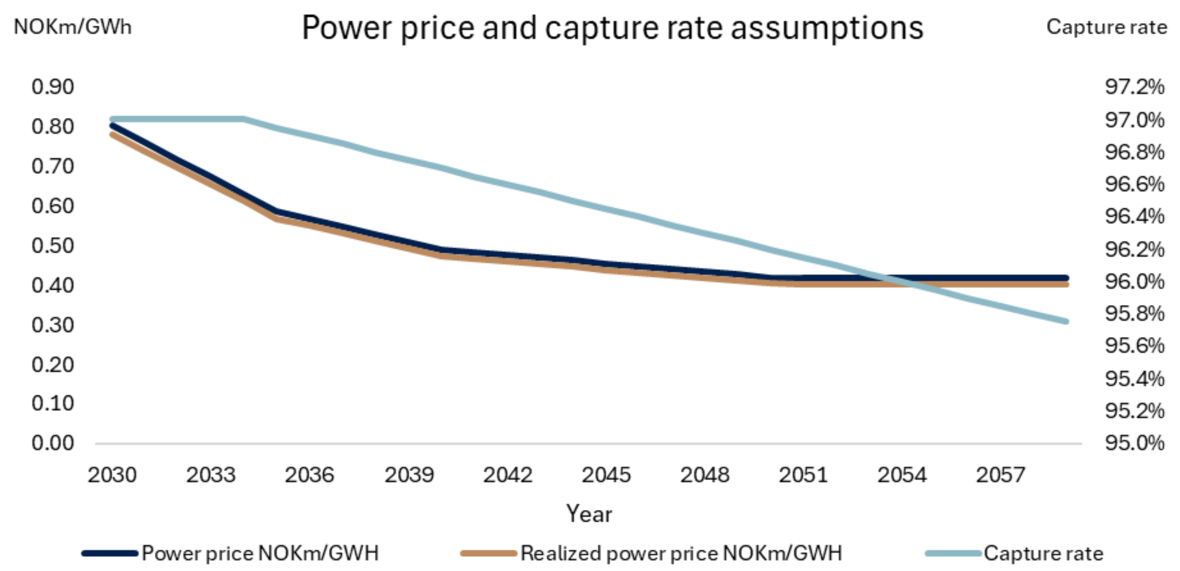

Figure 17 - Power price estimates combined with expected capture rate and realized power price. Source: NVE

The investment cost includes all capital expenditures, such as equipment, construction, grid connection, and permitting. These costs significantly impact the financial feasibility, as they determine the upfront capital required and the breakeven point over the project’s lifespan. Wind companies typically estimate expenses in the range of NOK 13–17 million per MW. This estimate carries some uncertainties, as no recent investments have been made in Norway. Wind companies also have the option to purchase turbines from Chinese manufacturers, which reduces investment costs substantially. Despite this, concerns regarding the quality, reliability, and aftermarket support of Chinese turbines lead most companies to prefer established suppliers such as Vestas or Siemens Gamesa.

The NPV calculation uses the cost of capital derived from survey responses, supplemented by insights gathered through in-depth interviews with four wind companies. This approach ensures that the cost of capital aligns with the prevailing market rates, providing a realistic and representative basis for the analysis. Given the variation in the reported cost of capital, sensitivity analyses are conducted to evaluate how the resource rent tax affects the NPV across different capital requirements. Figure 18 illustrates the cost of capital reported by the surveyed companies and analysts.

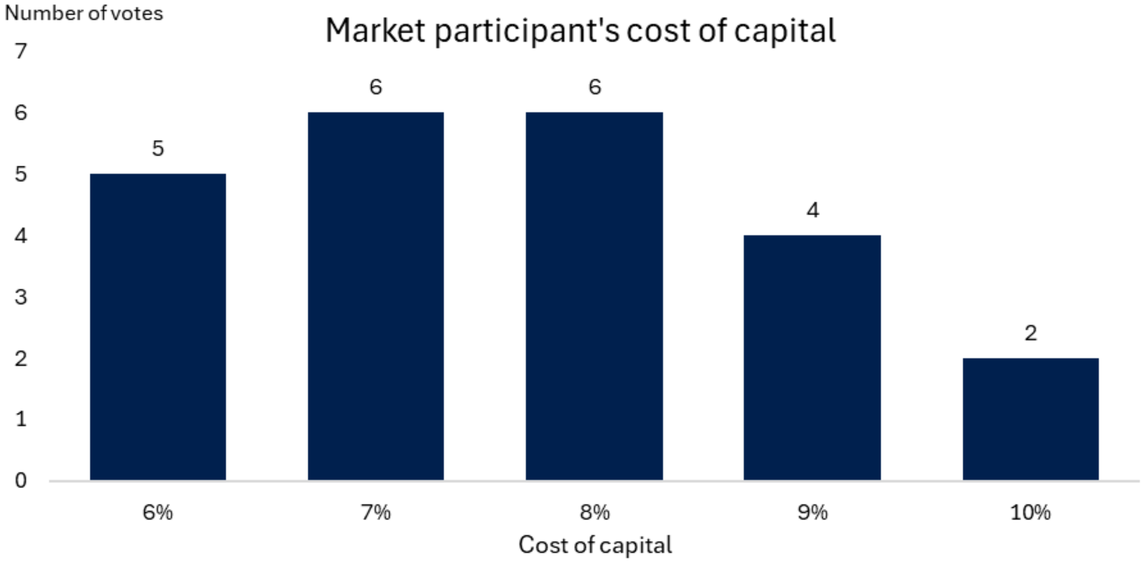

Figure 18 - Overview of market participant's cost of capital

7.2 Profitability without resource rent tax

To illustrate the impact of the resource rent tax, the analysis will first examine the expected cash flow of a new 50 MW wind farm project as it would have appeared without the resource rent tax. This provides a basis for comparing the project's profitability with and without the resource rent tax. Figure 19 provides an excerpt from the projected cash flow for the wind farm. All amounts are in million NOK, and the projections are based on the assumptions outlined in the previous chapter.

Year	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
Revenue	**0**	**0**	**130**	**123**	**116**	**109**	**102**	**95**	**91**	**67**	**67**	**67**	**67**	**67**	**67**
Lease	0	0	-5	-5	-5	-4	-4	-4	-4	-3	-3	-3	-3	-3	-3
Opex	0	0	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22
Corporate tax	0	0	0	0	0	0	0	0	0	-8	-8	-9	-9	-9	0
Production fee	0	0	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
Property tax	0	0	-3	-3	-3	-3	-3	-3	-3	-1	0	0	0	0	0
Cash flow from operations	**0**	**0**	**96**	**89**	**83**	**76**	**69**	**63**	**60**	**30**	**30**	**30**	**30**	**30**	**39**
Capex	-350	-350	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash flow from investments	**-350**	**-350**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
New debt	0	245	0	0	0	0	0	0	0	0	0	0	0	0	0
Amortization on debt	0	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
Interests	0	-15	-15	-14	-14	-13	-13	-12	-12	-3	-2	-2	-1	-1	0
Cash flow from financing	**0**	**222**	**-23**	**-22**	**-22**	**-21**	**-21**	**-20**	**-20**	**-11**	**-10**	**-10**	**-9**	**-9**	**-8**
Net cash flow	**-350**	**-128**	**73**	**67**	**61**	**55**	**49**	**43**	**40**	**19**	**20**	**20**	**21**	**21**	**30**

IRR	**6.3%**
NPV	**-39**

Figure 19 - Excerpt from the projected cash flow for a wind farm with 50MW capacity and with no resource rent tax. Cash flow is based on the assumption outlined in chapter 7.1.

The cash flow demonstrates what wind farm companies can expect from a wind farm project without the resource rent tax. As shown, the IRR is 6.3%, which is relatively low and below the cost of capital for most market participants. This indicates that companies with a cost of capital exceeding 6.3% would not pursue the project. However, some participants reported a cost of capital as low as 6.0%, suggesting they might proceed with the investment.

The net present value (NPV) further highlights the project's limited attractiveness. With a discount rate of 7.5%, the project yields an NPV of NOK -39 million, reinforcing that most surveyed companies would likely not proceed with such a project. Figure 20 illustrates how the NPV in NOK millions varies with the cost of capital and the investment cost. The NPV decreases significantly as the cost of capital rises. Most of the companies surveyed reported a cost of capital between 6% and 9%, placing their potential NPVs in the range of moderately positive to highly negative, depending on the investment cost.

		Investment cost (NOKm/MW)						
		11	**12**	**13**	**14**	**15**	**16**	**17**
Cost of capital	**6.0%**	131	91	50	10	-31	-72	-114
	6.5%	111	72	32	-8	-48	-89	-130
	7.0%	93	54	15	-24	-64	-104	-145
	7.5%	76	38	-1	-39	-79	-118	-159
	8.0%	60	23	-15	-53	-92	-131	-171
	8.5%	46	9	-28	-66	-105	-143	-183
	9.0%	33	-4	-41	-78	-116	-155	-194
	9.5%	20	-16	-52	-89	-127	-165	-203
	10.0%	9	-27	-63	-99	-136	-174	-212

Figure 20 - Sensitivity analysis of NPV with investment cost and cost of capital as variables

Figure 21 illustrates how the IRR varies with changes in the power price and the load factor, assuming a constant electricity price throughout the project's lifetime. The sensitivity shows that the IRR is highly sensitive to even small changes in the electricity price. A variation of just NOK 0.05/kWh around the spot price can determine whether the project is viable or not. Similarly, the load factor plays a critical role, as a 1 percentage point increase or decrease can be determinant of the project's viability.

Load factor	Average power price in the spot market (NOK/kWh) 0.40	0.45	0.50	0.55	0.60	0.65	0.70
35%	0.1%	2.1%	3.6%	5.0%	6.4%	7.8%	9.0%
36%	0.4%	2.3%	3.9%	5.3%	6.8%	8.1%	9.4%
37%	0.7%	2.5%	4.1%	5.7%	7.1%	8.5%	9.8%
38%	1.0%	2.8%	4.4%	6.0%	7.4%	8.8%	10.2%
39%	1.3%	3.0%	4.7%	6.3%	7.7%	9.2%	10.5%
40%	1.6%	3.3%	5.0%	6.6%	8.1%	9.5%	10.9%
41%	1.7%	3.5%	5.2%	6.8%	8.4%	9.8%	11.2%

Figure 21 - Sensitivity analysis of IRR with power price and load factor as variables

Figure 22 shows how the IRR varies based on changes in the power price and the project's investment cost. Even small increases in investment cost significantly reduce the IRR across all power price levels. For instance, at a power price of NOK 0.55/kWh, the IRR drops from 7.8% at an investment cost of NOK 12m/MW to just 4.5% at NOK 16m/MW, emphasizing the critical impact of investment cost on the project's profitability.

Investment cost (NOKm/MW)	Average power price in the spot market (NOK/kWh) 0.40	0.45	0.50	0.55	0.60	0.65	0.70
11.0	3.2%	5.2%	7.1%	8.9%	10.6%	12.2%	13.8%
12.0	2.4%	4.3%	6.1%	7.8%	9.4%	10.9%	12.4%
13.0	1.7%	3.5%	5.2%	6.8%	8.4%	9.8%	11.2%
14.0	1.0%	2.8%	4.4%	6.0%	7.4%	8.8%	10.2%
15.0	0.2%	2.2%	3.7%	5.2%	6.6%	7.9%	9.2%
16.0	-0.5%	1.7%	3.1%	4.5%	5.8%	7.1%	8.4%
17.0	-1.1%	1.0%	2.5%	3.9%	5.2%	6.4%	7.6%

Figure 22 - Sensitivity analysis of IRR with power price and investment cost as variables

7.3 Resource rent tax without government payouts

This chapter examines the impact of the resource rent tax under the assumption that ESA will not approve government payouts of negative resource rent taxes to companies. Rather than receiving payouts, companies will carry forward the negative tax amounts, which will compound at the risk-free rate. Figure 23 shows an excerpt from the projected cash flow for a new wind farm with a capacity of 50 MW. All figures are in million NOK and based on the assumptions outlined in Chapter 7.1.

Year	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
Revenue	**0**	**0**	**130**	**123**	**116**	**109**	**102**	**95**	**91**	**67**	**67**	**67**	**67**	**67**	**67**
Lease	0	0	-5	-5	-5	-4	-4	-4	-4	-3	-3	-3	-3	-3	-3
Opex	0	0	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22
Corporate tax	0	0	0	0	0	0	0	0	0	-8	-8	-9	-9	-9	0
Resource rent	0	0	0	0	0	0	0	0	0	0	-3	-8	-8	-8	-10
Production fee	0	0	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
Property tax	0	0	-3	-3	-3	-3	-3	-3	-3	-1	0	0	0	0	0
Cash flow from operations	**0**	**0**	**96**	**89**	**83**	**76**	**69**	**63**	**60**	**30**	**27**	**22**	**22**	**22**	**28**
Capex	-350	-350	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash flow from investments	**-350**	**-350**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
New debt	0	245	0	0	0	0	0	0	0	0	0	0	0	0	0
Amortization on debt	0	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
Interests	0	-15	-15	-14	-14	-13	-13	-12	-12	-3	-2	-2	-1	-1	0
Cash flow from financing	**0**	**222**	**-23**	**-22**	**-22**	**-21**	**-21**	**-20**	**-20**	**-11**	**-10**	**-10**	**-9**	**-9**	**-8**
Net cash flow	**-350**	**-128**	**73**	**67**	**61**	**55**	**49**	**43**	**40**	**19**	**17**	**13**	**13**	**13**	**20**

IRR	**6.1%**
NPV	**-43**

Figure 173 - Excerpt from the projected cash flow for a 50 MW wind farm with resource rent tax without payouts. Cash flow is based on the assumption outlined in chapter 7.1.

Under the tax scenario described, the cash flow yields an IRR of 6.1%, which is relatively low and below the cost of capital for many market participants. This suggests that companies with a cost of capital above 6.1% would likely consider the project financially unviable. However, some wind companies operate with a cost of capital as low as 6.0%, indicating that a few might still consider moving forward with the investment.

The net present value underscores the project's limited attractiveness. At a discount rate of 7.5%, the NPV is NOK -43 million. This result underscores that the majority of the surveyed companies are unlikely to carry out the project. Figure 24 shows the variation in NPV, measured in NOK millions, based on changes in the cost of capital and investment cost. As the cost of capital increases, the NPV declines sharply. With most surveyed companies reporting a cost of capital between 6% and 9%, their projected NPVs range from slightly positive to significantly negative, depending on the level of investment cost.

		Investment cost (NOKm/MW)						
		11	12	13	14	15	16	17
Cost of capital	6.0%	99	68	37	4	-31	-72	-114
	6.5%	82	52	20	-13	-48	-89	-130
	7.0%	67	36	4	-29	-64	-104	-145
	7.5%	53	22	-10	-43	-79	-118	-159
	8.0%	40	9	-23	-57	-92	-131	-171
	8.5%	27	-4	-36	-69	-105	-143	-183
	9.0%	16	-15	-47	-81	-116	-155	-194
	9.5%	5	-26	-58	-91	-127	-165	-203
	10.0%	-5	-36	-68	-101	-136	-174	-212

Figure 24 - Sensitivity analysis of NPV with investment cost and cost of capital as variables

Compared to the scenario without a resource rent tax, the NPV is less sensitive to variations in the cost of capital and investment costs. The difference in sensitivity between the two tax scenarios is most pronounced when the cost of capital and investment costs are low, then it gradually decreases as the cost of capital and the investment cost increase. At investment costs exceeding NOK 15m/MW, there is no difference in sensitivity. The difference in sensitivity arises because the resource rent tax acts as a buffer, mitigating the impact of fluctuations in capital costs and investment costs on the NPV. By capturing a share of the project's surplus in highly profitable scenarios, the tax narrows the range of NPV outcomes. This effect is more pronounced at lower costs of capital and investment costs, as profitability is higher. As the investment costs and the cost of capital increase, the influence of the tax diminishes. This is because the wind farm is no longer in a resource rent tax position.

Figure 25 illustrates how the IRR varies with changes in the power price and the project's load factor. Similar to the scenario without resource rent tax, the IRR is highly sensitive to even minor fluctuations in the electricity price. A variation of just NOK 0.05/kWh around the spot price can determine whether the project is viable or not. The load factor also plays an important role, as a few percentage points increase or decrease can be a determinant of the project’s viability.

Load factor	0.40	0.45	0.50	0.55	0.60	0.65	0.70
	Average power price in the spot market (NOK/kWh)						
35%	0.1%	2.1%	3.6%	5.0%	6.1%	7.2%	8.3%
36%	0.4%	2.3%	3.9%	5.3%	6.4%	7.5%	8.6%
37%	0.7%	2.5%	4.1%	5.5%	6.6%	7.8%	8.9%
38%	1.0%	2.8%	4.4%	5.7%	6.9%	8.1%	9.3%
39%	1.3%	3.0%	4.7%	6.0%	7.2%	8.4%	9.6%
40%	1.6%	3.3%	5.0%	6.2%	7.5%	8.7%	9.9%
41%	1.7%	3.5%	5.2%	6.5%	7.8%	9.0%	10.2%

Figure 185 - Sensitivity analysis of IRR with power price and load factor as variables

Compared to the scenario without resource rent tax, the IRR is more sensitive to variations in the power price and load factor in the absence of resource rent tax. This is particularly pronounced at higher power prices and load factors. The explanation is similar to the sensitivity for the cost of capital and investment cost: as the company's profitability increases, the resource rent tax works as a buffer that reduces the impact of fluctuations.

Figure 26 illustrates how the IRR changes in response to variations in power price and investment cost. Even modest increases in investment costs result in significant reductions in IRR across all power price levels. For instance, at a power price of NOK 0.55/kWh, the IRR drops from 8.3% at an investment cost of NOK 11m/MW to just 3.9% at NOK 17m/MW.

Investment cost (NOKm/MW)	0.40	0.45	0.50	0.55	0.60	0.65	0.70
	Average power price in the spot market (NOK/kWh)						
11.0	3.2%	5.2%	6.8%	8.3%	9.8%	11.2%	12.5%
12.0	2.4%	4.3%	5.9%	7.3%	8.7%	10.0%	11.3%
13.0	1.7%	3.5%	5.2%	6.5%	7.7%	9.0%	10.2%
14.0	1.0%	2.8%	4.4%	5.7%	6.9%	8.1%	9.3%
15.0	0.2%	2.2%	3.7%	5.1%	6.2%	7.3%	8.4%
16.0	-0.5%	1.7%	3.1%	4.5%	5.6%	6.6%	7.7%
17.0	-1.1%	1.0%	2.5%	3.9%	5.1%	6.0%	7.0%

Figure 26 - Sensitivity analysis of IRR with power price and investment cost as variables

Figure 27 shows how the IRR varies based on changes in power price and resource rent tax rate. The government initially proposed a resource rent tax rate of 51.3%. The sensitivity shows that this would have caused a decrease in the IRR from 5.7% to 5.1%, assuming a power price of NOK 0.55/kWh. The sensitivity also reveals that the tax rate barely has any impact on the IRR before the power price reaches NOK 0.55/kWh. This is because the project's profitability falls below the threshold at which the resource rent tax becomes applicable. This is beneficial because it ensures that projects are not taxed when no superprofit exists. By only taxing profits that exceed a certain threshold, the system avoids imposing an unnecessary financial burden when market conditions are less favorable.

The sensitivity also shows that changes in the tax rate have a greater impact on the IRR as power prices increase. This is because higher profitability results in a larger share of the profits being subject to taxation. In contrast, at lower power prices, the project's profitability is closer to the taxable threshold. Hence, changes in the tax rate affect a smaller portion of the revenue, resulting in a smaller impact on the IRR. Furthermore, the sensitivity reveals that the same percentage point increase in the tax rate has a greater impact on the IRR when starting from a higher base tax rate. For example, at a power price of NOK 0.70/kWh, the IRR decreases by 0.2 percentage points when the resource rent tax rate is raised by 6.4 percentage points, from 12.9% to 19.3%. In contrast, the IRR declines by 0.4 percentage points when the tax rate is increased by the same 6.4 percentage points, from 44.9% to 51.3%. This is because, at higher base tax rates, a larger portion of the project's profits is already taxed, so further increases reduce net profits more significantly. This creates a compounding effect, where the same percentage point increase has a greater impact on the IRR at higher tax levels. In contrast, at lower tax rates, the same increase affects a smaller portion of profits, leading to a smaller impact on the IRR.

	Average power price in the spot market (NOK/kWh)						
RR tax rate	0.40	0.45	0.50	0.55	0.60	0.65	0.70
12.9%	1.0%	2.8%	4.4%	6.0%	7.4%	8.8%	10.1%
19.3%	1.0%	2.8%	4.4%	6.0%	7.4%	8.6%	9.9%
25.7%	1.0%	2.8%	4.4%	5.9%	7.2%	8.4%	9.6%
32.1%	1.0%	2.8%	4.4%	5.7%	6.9%	8.1%	9.3%
38.5%	1.0%	2.8%	4.4%	5.5%	6.7%	7.8%	8.9%
44.9%	1.0%	2.8%	4.3%	5.3%	6.4%	7.4%	8.5%
51.3%	1.0%	2.8%	4.2%	5.1%	6.1%	7.1%	8.1%

Figure 27 - Sensitivity analysis of IRR with power price and resource rent tax rate as variables

Figure 28 provides a more detailed sensitivity of the IRR’s changes to variations in power price and resource rent tax. The sensitivity shows that, without the resource rent tax, market participants would begin considering investing in new wind farm projects at a power price of NOK 0.55/kWh, all else equal. Under the current tax rate, market participants will start considering investments at NOK 0.56/kWh. However, at a tax rate of 51.3%, as initially proposed by the government, investments would not be considered until the power price reaches NOK 0.60/kWh. Most market participants target an IRR of at least 7-8%. Without the resource rent tax, achieving this would require a power price of at least NOK 0.59/kWh to NOK 0.62/kWh. However, under the current resource rent tax, the required power price increase from NOK 0.60/kWh to NOK 0.65/kWh.

RR tax rate	Average power price in the spot market (NOK/kWh)										
	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62	0.63	0.64	0.65
0.0%	5.96%	6.26%	6.55%	6.85%	7.14%	7.43%	7.71%	7.99%	8.27%	8.55%	8.83%
32.1%	5.74%	5.98%	6.22%	6.45%	6.69%	6.93%	7.16%	7.40%	7.63%	7.87%	8.10%
51.3%	5.09%	5.28%	5.47%	5.66%	5.86%	6.06%	6.26%	6.47%	6.67%	6.87%	7.07%

Figure 28 - Detailed sensitivity analysis of IRR with power price and resource rent tax rate as variables

In conclusion, the resource rent tax reduces the IRR slightly, from 6.3% to 6.1%, based on NVE's power price estimates. The tax primarily limits the upside by capturing a portion of surplus profits in highly profitable scenarios, acting as a buffer that narrows the range of outcomes. However, it has no effect on the downside, as it does not apply when profits fall below the tax threshold. The differences in power price required for an investment, with and without the resource rent tax, are relatively small, especially when compared to the natural variability in power prices. This suggests that the resource rent tax is unlikely to significantly deter new wind farm investments from a financial perspective, as most projects remain viable within a similar power price range.

7.4 Resource rent tax with government payouts

This chapter examines the impact of the resource rent tax under the assumption that ESA will approve government payouts for negative taxes. Figure 29 shows the projected cash flow for a new wind farm with a capacity of 50 MW. All figures are in million NOK and based on the assumptions outlined in chapter 7.1.

Year	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
Revenue	**0**	**0**	**130**	**123**	**116**	**109**	**102**	**95**	**91**	**67**	**67**	**67**	**67**	**67**	**67**
Lease	0	0	-5	-5	-5	-4	-4	-4	-4	-3	-3	-3	-3	-3	-3
Opex	0	0	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22
Corporate tax	0	0	0	0	0	0	0	0	0	-8	-8	-9	-9	-9	0
Resource rent	0	0	209	-26	-23	-21	-18	-16	-15	-8	-8	-8	-8	-8	-10
Production fee	0	0	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
Property tax	0	0	-3	-3	-3	-3	-3	-3	-3	-1	0	0	0	0	0
Cash flow from operations	**0**	**0**	**305**	**64**	**60**	**56**	**51**	**47**	**45**	**23**	**23**	**22**	**22**	**22**	**28**
Capex	-350	-350	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash flow from investments	**-350**	**-350**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
New debt	0	245	0	0	0	0	0	0	0	0	0	0	0	0	0
Amortization on debt	0	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
Interests	0	-15	-15	-14	-14	-13	-13	-12	-12	-3	-2	-2	-1	-1	0
Cash flow from financing	**0**	**222**	**-23**	**-22**	**-22**	**-21**	**-21**	**-20**	**-20**	**-11**	**-10**	**-10**	**-9**	**-9**	**-8**
Net cash flow	**-350**	**-128**	**282**	**42**	**38**	**34**	**31**	**27**	**25**	**12**	**12**	**13**	**13**	**13**	**20**

IRR	**7.4%**
NPV	**-3**

Figure 199 - Excerpt from the projected cash flow for a 50 MW wind farm with resource rent tax including payouts. Cash flow is based on the assumption outlined in chapter 7.1

The cash flow provides an overview of the financial outlook for companies investing in a wind farm project, assuming negative resource rent taxes are refunded to the companies once the wind farm becomes operational. With an IRR of 7.4%, the project's return is in line with the cost of capital used by many of the surveyed companies and analysts. However, for companies with a cost of capital exceeding 7.4%, the project would be considered financially unviable.

The net present value underscores the project's limited financial attractiveness. At a discount rate of 7.5%, the cash flow yields an NPV of NOK -3 million, indicating that many of the surveyed companies would likely consider the project unviable and choose not to proceed. Figure 30 shows how the NPV, measured in NOK millions, varies based on changes in the cost of capital and investment costs. As the cost of capital increases, the NPV declines significantly. With most surveyed companies reporting a cost of capital between 6% and 9%, the projected NPVs are within the range of NOK 32 million to NOK -31 million, assuming an investment cost of NOK 14m per MW. In terms of investment costs, the sensitivity shows that all companies with a cost of capital below 7.5% would proceed with the project if the investment cost were NOK 14m per MW or lower. However, if the investment cost rises to NOK 15m/MW, only market participants with a cost of capital at 6% or lower would find the project financially viable.

		Investment cost (NOKm/MW)						
		11	12	13	14	15	16	17
Cost of capital	6.0%	113	86	59	32	4	-24	-53
	6.5%	100	73	46	19	-8	-36	-64
	7.0%	87	61	34	8	-19	-47	-75
	7.5%	75	49	23	-3	-30	-57	-85
	8.0%	64	38	13	-13	-39	-66	-94
	8.5%	53	28	3	-22	-48	-75	-102
	9.0%	44	19	-6	-31	-57	-83	-110
	9.5%	35	10	-14	-39	-65	-91	-118
	10.0%	26	2	-22	-47	-72	-98	-125

Figure 30 - Sensitivity analysis of NPV with investment cost and cost of capital as variables

Comparing the sensitivities with and without the resource rent tax, it is clear that the NPV is more sensitive to variations in the cost of capital in the scenario without the tax. This difference in sensitivity is most pronounced at lower cost of capital levels and gradually diminishes as the cost of capital increases. However, when the cost of capital is held constant and the investment cost is varied, the difference in sensitivity between the two scenarios remains largely consistent. When comparing the best-case scenario (6% cost of capital and NOK 11m/MW), the NPV is higher in the scenario without the resource rent tax. This is because, in highly profitable situations, the resource rent tax captures a portion of the project's surplus, reducing the NPV's upside. In contrast, when examining the worst-case scenario (10% cost of capital and NOK 17m/MW), the NPV is higher in the scenario with the resource rent tax. This is due to the payouts of negative resource rent taxes. This mechanism makes the government a co-investor, collecting taxes during periods of positive resource rent and providing payouts when resource rent turns negative.

Figure 31 shows the difference in NPV between the scenario where the resource rent tax includes payouts for negative resource rent and the scenario where it does not (as discussed in Chapter 7.3). The sensitivity shows that the NPV is higher across all combinations of investment cost and cost of capital when the negative resource rent tax is paid out. This occurs because, in the payout scenario, the project receives a significant payout in the first year of operation due to the large negative resource rent tax generated by the high investment cost during the first two years. In contrast, in the scenario without payouts, the negative resource rent tax is carried forward, compounded at a risk-free rate, and deducted from future tax payments. Due to the time value of money, receiving the negative tax amount at the start of the period results in a higher NPV. This effect is even more pronounced at higher costs of capital, where early cash flows are more valuable. Additionally, as investment costs increase, the magnitude of the negative resource rent tax grows, further widening the gap between the NPV in the two tax scenarios.

		Investment cost (NOKm/MW)						
		11	12	13	14	15	16	17
Cost of capital	6.0%	15	18	23	28	35	48	61
	6.5%	17	22	27	33	40	53	66
	7.0%	20	24	30	37	45	57	70
	7.5%	22	27	33	40	49	62	74
	8.0%	24	30	36	44	53	65	78
	8.5%	26	32	39	47	56	68	81
	9.0%	28	34	41	50	59	71	83
	9.5%	29	36	44	52	62	74	86
	10.0%	31	38	46	54	64	76	88

Figure 31 - Difference in NPV between the scenario where the resource rent tax includes payouts and where it does not

Figure 32 illustrates how the IRR fluctuates with changes in the load factor and electricity price, assuming a constant electricity price throughout the project’s lifetime. Similar to the scenarios without a resource rent tax and with a resource rent tax without payouts, the sensitivity shows that the IRR is highly sensitive to even minor variations in the electricity price. A change of just NOK 0.05/kWh in the spot price can determine whether the project is financially viable. Likewise, the load factor plays a crucial role, as a few percentage points increase or decrease can significantly impact the project's viability.

		Average power price in the spot market (NOK/kWh)						
		0.40	0.45	0.50	0.55	0.60	0.65	0.70
Load factor	35%	0.7%	2.8%	4.3%	5.7%	7.1%	8.5%	9.8%
	36%	1.0%	3.0%	4.6%	6.1%	7.5%	8.9%	10.2%
	37%	1.4%	3.3%	4.9%	6.4%	7.9%	9.2%	10.5%
	38%	1.7%	3.5%	5.2%	6.7%	8.2%	9.6%	10.9%
	39%	2.1%	3.8%	5.5%	7.0%	8.5%	10.0%	11.3%
	40%	2.4%	4.1%	5.8%	7.4%	8.9%	10.3%	11.7%
	41%	2.6%	4.3%	6.1%	7.7%	9.2%	10.7%	12.1%

Figure 32 - Sensitivity analysis of IRR with power price and load factor as variables

Comparing the sensitivity to the scenario without the resource rent tax, there is a negligible difference in how sensitive the IRR is. At lower power prices and resource rent tax rates, the IRR is slightly more sensitive to changes in the variables when the resource rent tax is applied. Conversely, at higher power prices and tax rates, the IRR becomes slightly more sensitive in the absence of the resource rent tax. This is because the company's profitability increases at high power prices and load factors. The resource rent tax will then reduce the impact of fluctuations.

Figure 33 illustrates how the IRR changes in response to variations in power price and investment cost. Even modest increases in investment costs lead to substantial reductions in IRR across all power price levels. For example, at a power price of NOK 0.55 /kWh, the IRR declines from 9.9% at an investment cost of NOK 11m/MW to just 4.5% at NOK 17m/MW.

Investment cost (NOKm/MW)	Average power price in the spot market (NOK/kWh)						
	0.40	0.45	0.50	0.55	0.60	0.65	0.70
11.0	4.2%	6.2%	8.1%	9.9%	11.6%	13.2%	14.6%
12.0	3.3%	5.2%	7.0%	8.7%	10.3%	11.8%	13.3%
13.0	2.6%	4.3%	6.0%	7.7%	9.2%	10.6%	12.0%
14.0	1.7%	3.5%	5.2%	6.7%	8.2%	9.6%	10.9%
15.0	0.8%	2.9%	4.4%	5.9%	7.3%	8.7%	9.9%
16.0	0.0%	2.3%	3.7%	5.1%	6.5%	7.8%	9.1%
17.0	-0.8%	1.5%	3.1%	4.5%	5.8%	7.0%	8.2%

Figure 203 - Sensitivity analysis of IRR with power price and investment cost as variables

Figure 34 shows how the IRR changes based on variations in power price and resource rent tax rate. The government initially proposed a resource rent tax rate of 51.3%. From the sensitivity, we can see that this would have caused a decrease in the IRR from 6.7% to 6.5%, assuming a power price of NOK 55/kWh. Furthermore, the sensitivity reveals that the same percentage point increase in the tax rate has a greater impact on the IRR when starting from a higher base tax rate. For example, at a power price of NOK 0.4/kWh, the IRR decreases by 0.1 percentage point when the resource rent tax rate is raised by 6.4 percentage points, from 12.9% to 19.3%. In contrast, the IRR drops 0.2 percentage points when the tax rate is increased by the same 6.4 percentage points, from 44.9% to 51.3%. This is because, at higher tax rates, a larger portion of the project's profits is already taxed, so further increases reduce net profits more significantly. This creates a compounding effect, where the same percentage point increase has a greater impact on IRR at higher tax levels. In contrast, at lower tax rates, the same increase affects a smaller portion of profits, leading to a smaller impact on IRR.

RR tax rate	Average power price in the spot market (NOK/kWh)						
	0.40	0.45	0.50	0.55	0.60	0.65	0.70
12.9%	2.0%	3.7%	5.3%	6.8%	8.3%	9.6%	10.9%
19.3%	1.9%	3.7%	5.3%	6.8%	8.2%	9.6%	10.9%
25.7%	1.8%	3.6%	5.2%	6.8%	8.2%	9.6%	10.9%
32.1%	1.7%	3.5%	5.2%	6.7%	8.2%	9.6%	10.9%
38.5%	1.6%	3.4%	5.1%	6.7%	8.2%	9.6%	10.9%
44.9%	1.4%	3.3%	5.0%	6.6%	8.1%	9.6%	10.9%
51.3%	1.2%	3.1%	4.9%	6.5%	8.1%	9.5%	10.9%

Figure 34 - Sensitivity analysis of IRR with power price and resource rent tax rate as variables

Figure 35 illustrates the IRR's sensitivity to variations in power price and the resource rent tax. The sensitivity indicates that without the resource rent tax, market participants will begin considering investing in new wind farms at a power price of NOK 0.55/kWh, all else being equal. With the current tax rate, market participants will begin to consider investments at a power price of NOK 0.53/kWh, while under a tax rate of 51.3%, as initially proposed by the government, investments would commence at NOK 0.54/kWh. Most market participants require an IRR of at least 7-8%. To meet this threshold, it requires a power price of at least NOK 0.59/kWh to NOK 0.62/kWh without the resource rent tax. However, under the current resource rent tax discussed in this chapter, the required power price decreases to NOK 0.56/kWh to NOK 0.59/kWh. When compared to the resource rent tax without payouts, the inclusion of payouts lowers the power price required for investments by approximately 7-10%.

RR tax rate	Average power price in the spot market (NOK/kWh)										
	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
0.0%	5.04%	5.35%	5.65%	5.96%	6.26%	6.55%	6.85%	7.14%	7.43%	7.71%	7.99%
32.1%	5.80%	6.11%	6.42%	6.73%	7.03%	7.32%	7.62%	7.91%	8.20%	8.49%	8.77%
51.3%	5.54%	5.87%	6.20%	6.53%	6.85%	7.16%	7.47%	7.78%	8.08%	8.38%	8.68%

Figure 35 - Detailed sensitivity analysis of IRR with power price and resource rent tax rate as variables

In conclusion, the resource rent tax increases the IRR from 6.3% to 7.4%, based on NVE's power price estimates. Although the tax limits the upside by capturing a portion of surplus profits in highly profitable scenarios, it also limits the downside by providing payouts for negative resource rent taxes. The differences in the power price required for an investment, with and without the resource rent tax, are relatively minor, especially when compared to the fluctuations in power prices. If the resource rent tax includes payouts, the investment threshold is lowered by a few øre/kWh, indicating that the resource rent tax has a positive effect on new wind farm investments from a financial perspective.

7.5 Chapter summary

This chapter examines the financial implications of the resource rent tax on new wind farm investments. In the scenario without government payouts, the IRR decreases from 6.3% to 6.1%, reflecting a slight negative effect on the attractiveness of the wind farm. The tax primarily reduces the upside potential by capturing a share of the surplus profits generated in highly profitable scenarios. This effectively acts as a cap on earnings, narrowing the range of financial outcomes and limiting the potential for exceptionally high returns. In unprofitable scenarios, the tax has no effect, as it does not apply when profits fall below a certain threshold. Although the impact is minimal, the tax further diminishes the financial viability of projects that are already struggling to meet the cost of capital requirements. However, the resource rent tax does not pose a financial barrier and should have a minimal effect on future investments from a financial perspective.

When including payouts for negative resource rent taxes, it increases the IRR from 6.3% to 7.4%, making the project significantly more attractive. Although the tax reduces the upside potential by capturing a portion of surplus profits, the payout mechanism allows companies to receive immediate compensation for negative resource rent taxes, effectively sharing the downside risk with the government. This reduces the reliance on consistently high profitability and improves early cash flows, which is particularly valuable for projects with high investment costs and high cost of capital. From a financial perspective, the resource rent tax makes more projects financially viable and should encourage increased investment activity.

8. Consequences of the resource rent tax

8.1 Political risk

Enacting the resource rent tax encountered significant challenges and obstacles in its early stages. The proposal surprised the industry, sparking considerable controversy and widespread criticism (Solgård et al., 2022).

The government's initial proposal was to introduce a 40% resource rent tax, resulting in a 61% marginal tax rate, alongside an increased production fee (Bjerke & Golten, 2022). The lack of a detailed proposal during the initial announcement created considerable uncertainty, prompting responses like Cloudberry's September 30th, 2022, market announcement. Cloudberry expected the tax to take the form of a cash flow tax, similar to those applied in the hydropower and petroleum sectors and anticipated that this structure would positively influence new investments (Cloudberry, 2022).

The government provided further details in the December 16 consultation paper in response to industry criticism. In this proposal, the government suggested that the resource rent tax should not include payouts of negative resource rent tax (The Norwegian Ministry of Finance, 2022). Unlike the resource rent tax for petroleum and hydropower, where negative tax balances are paid out, the proposed model only allowed for losses to be carried forward. This difference, combined with the use of a risk-free rate for carrying forward losses, drew criticism from many industry players and created further discontent within the market (KPMG, 2023).

The consultation paper set a deadline of March 15, 2023, for companies and stakeholders in the wind farm sector to submit their feedback. By this deadline, the ministry had received 148 responses, primarily from wind farm investors, developers, municipalities, governmental departments, law firms, and various interest groups. A common theme in the feedback from wind farm investors was strong opposition to the proposed transition rules for existing wind farms. The retrospective application of the tax to already established wind farms was particularly controversial, as many responses highlighted this as a significant interference with prior investments. It was argued that such a change undermined profitability and reduced the value of these investments.

Additionally, there was widespread criticism of how negative resource rent was to be handled. Many respondents argued that carrying forward losses with a risk-free rate would make the tax distortionary, further exacerbating concerns about the proposal's fairness and long-term impact on the industry.

The consultation period revealed significant opposition to key aspects of the proposed resource rent tax. Coupled with substantial political disagreement, this prompted the government to announce on the 11th of May 2023 that the implementation of the tax would be postponed until 2024. The news was shared in connection with the revised state budget, and was met with relief in the market. For instance, Cloudberry's stock price rose by 7.3% (Præstrud & Kjøllesdal, 2023).

On September 29th, 2023, the Ministry of Finance introduced *Prop. 2 LS (2023-2024)*, in connection with the revised national budget. The revised proposal was shaped by feedback from the consultation process. While many stakeholders acknowledged that the revised proposal represented a step in the right direction, concerns remained about its distortionary effects and its potential to deter investments in Norwegian wind farms. Key changes in the revised proposal included that the effective tax rate was reduced to 35%, improved transition rules for existing wind farms, deduction rules more closely aligned with those in the hydropower and petroleum sectors, and a provision allocating half of the resource rent tax revenue to municipalities hosting wind farms. However, despite these adjustments, the high tax rate remained the primary concern among critics.

Tord Lien, CEO of Aneo at the time, voiced his concerns to *Finansavisen* about the potential impact of the proposed resource rent tax. He warned that it could create national and international uncertainty in financial circles (Hyvang & Røiseland, 2023). Lien noted that many pension funds and other investors have chosen to invest in Norway based on a perception of stability and predictability.

Following the proposal's announcement, the next step was to obtain ratification from Parliament. However, significant disagreement emerged over key elements of the tax design, particularly the tax rate and the treatment of negative resource rent. The finance committee of the Norwegian Parliament was initially scheduled to finalize the matter by December 7th but postponed the deadline to December 9th and postponed once more before finally reaching an agreement on December 12th. Ultimately, there was a broad political agreement on the final tax model.

8.1.1 Signal effect of the process

The initial process was disorganized and faced criticism for failing to consider the perspectives of market players and for attempting to rush the tax's implementation. However, following a one-year postponement and extensive political negotiations, an agreement was finally reached. The agreement sought to reconcile political differences and create a foundation for stable and predictable operating conditions.

From the perspective of both domestic and foreign investors, the signals from this process were deeply concerning. An industry previously regarded as having stable operating conditions was now troubled by significant uncertainty over potential political actions, an environment far from ideal for investors. The decision to apply the tax retroactively to investments made years earlier sent a particularly alarming message to investors. By imposing taxes on already completed investments, the Ministry of Finance altered the fundamental assumptions underlying previous investment decisions, resulting in substantial devaluation of existing wind farms. This demonstrates a willingness to alter operating conditions and impose taxes that substantially reduce the value of prior investments.

8.1.2 Change in tax rate

With a broad political agreement now in place, it can be argued that the political risk associated with the resource rent tax has largely been mitigated since a tax that is already implemented cannot be introduced again. Its enactment, supported by a strong consensus across the political spectrum, should signal a degree of stability and predictability in this policy area. As such, the risk of significant reversals or policy changes appears small. This reduces the political risk for investors, enabling them to prioritize other considerations without fearing sudden policy shifts in this area.

However, recent developments suggest that there is still a risk that resource rent taxes and operating conditions may change. For instance, in 2022, the resource rent tax on hydropower increased from an effective rate of 37% to 45% (Bjerke & Golten, 2022). This demonstrates that even well-established tax regimes in Norway can be subject to significant adjustments over time. Such events underscore the political risk associated with investing in the country. Survey responses reflect this concern, with two respondents noting that the resource rent tax has increased political risk in Norway. However, another respondent emphasized that there will still be new investments if there is stability and clarity in the regulatory framework.

8.2 Norway's competitiveness as an investment destination

Chapter 2.5 outlines that onshore wind power production in the Nordic countries operates under broadly similar conditions, with the primary distinction being differences in tax regimes. Wind conditions, investment costs, and operating expenses are relatively uniform across the region. As such, the levelized cost of energy is relatively similar when excluding tax regimes. Power prices are also expected to be relatively similar across the region. This should make each country equally attractive before considering tax regimes.

This subchapter will examine the tax regimes applicable to onshore wind in the Nordic countries, focusing on the resource rent tax and its impact on Norway's competitiveness. We will also discuss the stability of the different tax regimes in the countries.

8.2.1 Norway

Wind farms are taxed at a corporate rate of 22% and are also subject to a property tax of up to 0.7%, determined by the host municipality. Additionally, they incur a resource rent tax with an effective rate of 25% and a production fee of 2.3 øre/kWh. Chapter 6 offers a more detailed overview of the tax regime.

8.2.2 Sweden

Wind farms in Sweden are subject to a corporate tax rate of 20.6%. Property tax conditions are favorable, as the tax base is calculated at 75% of the market value, with a property tax rate of 0.2% (KPMG, 2023). Additionally, an energy tax of 0.353 SEK/kWh applies but is charged only when electricity is delivered to consumers not registered for energy tax. Furthermore, there is no resource rent tax on the horizon (KPMG, 2023). The overall tax regime in Sweden is considered stable.

8.2.3 Finland

The tax regime in Finland is more similar to that of Sweden than Norway. Wind farms are subject to a corporate tax of 20% and a property tax based on the combined value of the land and the wind power facility, with rates typically ranging from 0% to 3.1% (KPMG, 2023). There are no expectations of a resource rent tax in the future (KPMG,2023). Renewables Finland, a leading advocacy organization for the Finnish wind and solar power industry, states that Finland has a stable policy environment that supports the growth of wind energy (Suomen Uusiutuvat ry, n.d.).

8.2.4 Denmark

Wind farms in Denmark are subject to a corporate tax of 22% (KPMG, 2023). Unlike other Nordic countries, Denmark does not impose a property tax on wind farms. However, if the land hosting the wind farm is sold or transferred, a 0.6% real estate tax on the property's value applies (KPMG, 2023).

Denmark has implemented various measures to boost local acceptance of wind farms. These measures include compensation for property value loss, an option for homeowners to sell their properties if it is significantly affected, annual bonuses for nearby residents based on energy production, and community funds to support local projects (Danish Energy Agency, 2024). Together, these policies foster greater collaboration between developers and local communities, ensuring the benefits of wind power are shared broadly.

8.2.5 Comparison of operating conditions and taxes

Comparing the operating conditions and tax regimes across Nordic countries there are both similarities and disparities. In terms of operating conditions, the Nordic countries have similar wind conditions, investment costs, operating costs, and power prices. However, as shown in Figure 36, tax regimes are different. Finland and Sweden operate with low corporate and property tax rates. Denmark, with a corporate tax rate of 22%, differs by imposing a real estate tax only when the land with the wind turbines is sold. Denmark also stands out positively for its initiatives aimed at municipalities to improve local acceptance of onshore wind projects.

	Tax comparison			
	Sweden	Finland	Denmark	Norway
Corporate Tax	20.60%	20.00%	22.00%	22.00%
Property Tax	0.20%	0.93-2.00%	0%	0.20-0.70%
Production Fee				2.3 øre/kWh
Effective Resource Rent Tax	0%	0%	0%	25%

Figure 36 – Comparison of fees and taxes between Nordic countries

Norway appears less competitive in this comparison due to its high corporate tax rate and property tax, which are at the upper end compared to other Nordic countries. Additionally, Norway has a production fee and a resource rent tax, neither of which exist in the other countries. The resource rent tax has also introduced political risk that is absent in other Nordic countries. There is no indication that a resource rent tax will be implemented elsewhere in the region, where policies prioritize stability and investment incentives (KPMG, 2023). These factors make Norway a less attractive investment destination and can result in capital flowing to its Nordic neighbors instead.

8.2.6 Market entry and exit

In the survey sent to companies and investors, one of the largest renewables investors in Finland stated they would never invest in Norway again. The general feedback from the survey was that it had a significant negative impact on companies' willingness to invest in Norway.

The survey asked respondents whether they believed the resource rent tax would prompt existing players to exit the market. Based on the theoretical framework outlined in Chapter 4, regulatory uncertainty and the introduction of the tax are likely to drive market exits. The survey's responses supported this expectation, as the majority of participants indicated that the tax would lead to market exits.

This year, several major market players are divesting their wind farm portfolios in Norway. For example, BlackRock, which had invested approximately five billion NOK in two wind farms, Gulesletten and Tellenes, has now sold both assets. Fredrik Norell at Blackrock, publicly announced that they could no longer justify remaining invested when the "rules of the game" are changed midway (Riisnæs, 2024). Blackrock is one of several international investors that has backed out of Norway after the announcement of the resource rent tax.

In July, the Swiss investment firm SUSI Partners sold the Tonstad Wind Farm in Sirdal to Hafslund, a company owned by Oslo Municipality. Similarly, the Midtfjellet Wind Farm shifted from foreign to domestic ownership when the German firm Aquila Capital sold it to Sunnhordland Kraftlag.

These transactions have led to the lowest level of international ownership in Norwegian wind farms in recent years (Pedersen, 2024). As shown in Figure 4, the ownership structure in 2023 consisted of 67% foreign capital. Since 2023, international ownership has dropped from 67% to 54% (Pedersen, 2024). This decline indicates growing uncertainty among international investors regarding Norway. Consequently, Norway may encounter significant challenges in attracting foreign capital for new wind power projects. Survey responses further suggest that some analysts have observed a decreased interest in Norwegian wind investments as a result of the tax changes.

The survey also asked respondents whether they believed the resource rent tax would deter new market entries. According to the theoretical foundation and real options theory, investors are inclined to withhold investment in uncertain markets, and higher tax burdens further reduce a country's investment appeal. The majority of respondents agreed that the resource rent tax would negatively impact both future investments and new market entries, with only two respondents expressing disagreement. This indicates a broad consensus on the tax's potential to discourage market participation.

8.3 Municipalities and resource rent tax

Municipal approval is one of the biggest bottlenecks in developing new wind power projects. Even when projects demonstrate a positive net present value, they are often halted due to lack of local support in the host municipality, especially after 2023.

In 2023, the permitting process was revised to grant municipalities greater influence over onshore wind projects within their jurisdiction. Under the updated process, municipalities can halt a project if they choose. Additionally, as of July 1, 2023, a new requirement under the Planning and Building Act mandates that municipalities must resolve planning issues before certain projects can proceed. This typically involves adopting a zoning plan to ensure local concerns are considered, providing municipalities with the authority to reject projects outright (NVE, 2024a). This highlights the importance of local acceptance.

8.3.1 Income for municipalities

The income for municipalities hosting wind farms is derived from the production fee, property tax, and a share of the resource rent tax. The government sets the production fee annually, which is currently 2.3 øre/kWh (NVE, 2024b). The property tax is set by the municipalities that host the wind farms. This tax is based on the assessed value of the wind power facility, and the tax rate can be set at as high as 0.7%. For the first ten years of a wind farm's operation, the assessed value is typically set at 90–95% of the initial investment base (KPMG, 2023).

The cash flow presented in Chapter 7 assumes a property tax rate of 0.5%. Based on the calculations, the property tax over ten years is estimated to be approximately 21 million NOK. For the first seven years, the annual income from the property tax is around three million NOK, gradually decreasing to two million for the subsequent years.

The revenue from the production fee is distributed proportionally among municipalities based on their share of total Norwegian wind power production. In the cash flow presented in Chapter 7, the production fee generates approximately 38 million NOK over the first ten years of operation.

The income generated from the resource rent tax is an important source of revenue, as 50% of the tax is earmarked for distribution to municipalities. However, as of the time this thesis was written, the provisions detailing how this income will be allocated among municipalities remain undefined. Consequently, it is challenging to determine the exact total revenue a municipality hosting a wind farm will receive. However, THEMA has conducted approximate calculations for a wind farm with an annual production of 1 TWh. Over ten years, such a wind farm is estimated to generate approximately 50 million NOK in revenue for the host municipality (Byenstuen et al., 2023).

The construction and installation of wind farms can generate significant economic benefits for local communities. These projects require substantial manpower and infrastructure development, which stimulate local economic activity. For example, during the construction phase of Odal Vindkraftverk, a 1 TWh facility, the host municipality received NOK 20 million for various services, while local and regional suppliers delivered goods and services valued at NOK 239 million (Byenstuen et al., 2023).

8.3.2 Municipality view on the windfarms

In response to the initial resource rent tax proposal, a substantial number of municipalities provided feedback during the hearing process. A total of 48 municipalities submitted their input, alongside a formal response from the National Association of Norwegian Wind Power Municipalities (LNVK). While LNVK expressed support for introducing a resource rent tax, they highlighted concerns about its inadequate connection to the local communities where the revenue is generated. Specifically, they feared that the income might disproportionately benefit wealthier, higher-inhabited, municipalities rather than those directly affected by the environmental impacts of wind farms (LNVK, 2023).

LNVK considers the production fee and property tax insufficient to compensate for the environmental disruptions caused. The organization emphasizes the need for greater compensation and supports the Energy Commission's proposal to allocate at least 15% of resource rent tax revenue directly to the host municipality (LNVK, 2023). This recommendation is a central element of LNVK's feedback.

Reviewing the individual responses from municipalities, 41 explicitly supported the proposal. Many emphasized the need for 50% of the resource rent tax revenue to be allocated directly to host municipalities, rather than pooled and redistributed across all municipalities. Although a few municipalities opposed LNVK’s stance, there was still a strong emphasis among them on ensuring that host municipalities receive a direct share of the income (Regjeringen, 2023). For instance, Orkland Municipality stated in its response (Orkland kommune, 2023):

> The municipality's share of revenue from resource rent taxation should primarily benefit host municipalities for onshore wind power and turbines, rather than being distributed through the municipal sector's income system. This revenue should provide a meaningful increase in income for host municipalities.

The approved legislation has neither altered the distribution of resource rent tax revenue nor provided clarity on how it will be allocated. Based on responses from municipalities, there is little evidence that suggests that the resource rent tax has significantly increased acceptance of onshore wind farms. Findings from a 2023 study on whether the resource rent tax improves local acceptance support this conclusion. The study indicates that the tax has led to a marginal increase in acceptance, though it has not been substantial enough to significantly impact concession approvals (Grønnbekk, 2023). Furthermore, the study highlights that a more generous allocation of resource rent tax revenue to host municipalities could enhance local acceptance.

8.4 Energy deficit

Norway's energy demand is projected to rise significantly, particularly leading up to 2030, driven by the electrification of the petroleum sector and other industrial processes. Emerging industries, such as hydrogen production and battery manufacturing, are also expected to contribute to increased power consumption. However, the introduction of the resource rent tax has reduced Norway's attractiveness as an investment destination for wind power. This is particularly concerning, as wind power is regarded by DNV (2024) as the only scalable option for new power generation.

NVE’s report on future energy markets forecasts minimal growth in Norway’s wind energy capacity by 2030. However, from 2030 to 2040, onshore wind capacity is expected to increase by approximately 6 GW, bringing the total capacity to 11 GW (Kirkerud, et al., 2023). As discussed, the resource rent tax has increased political risk, failed to improve local acceptance, and reduced the country’s competitiveness compared to other Nordic nations. As a result, the tax has made Norway a less attractive destination for both domestic and international investors. Consequently, Norway risks falling short of NVE’s wind capacity projections, which could lead to an energy deficit and compromise the country’s ability to meet its growing energy demands.

8.4.1 Offshore wind

New onshore wind farms are essential to meet the power balance forecast outlined in NVE’s power market analysis. However, onshore wind development is unlikely to meet increasing energy demands alone. According to the NVE report, offshore wind is expected to be increasingly important after 2030. The report projects a 1 TWh contribution from offshore wind by 2035, increasing to 18 TWh by 2040 (equal to the annual consumption of 900,000 Norwegian households) (Kirkerud, et al., 2023). While these estimates are subject to uncertainty, there is confidence that offshore wind will have a significant share of future energy production.

In this case, the question is whether the resource rent tax on onshore wind could have a spillover effect on offshore wind development. The introduction of the resource rent tax on onshore wind may lead investors to believe that a similar tax could eventually be applied to offshore wind projects. Although political signals suggest that such a tax is not currently under consideration, it remains a possibility (KPMG, 2023). This uncertainty could discourage investors from pursuing offshore wind projects in Norway, especially when such risks are not present in other countries (KPMG, 2023).

Offshore wind remains a costly energy source, with a projected Levelized Cost of Energy of 1.34 NOK/kWh, compared to 0.41 NOK/kWh for onshore wind (Kirkerud, et al.; NVE, u.d). The planned floating wind farms in the Vestaasen area are estimated to require subsidies of approximately NOK 35 billion, underscoring the low profitability of offshore wind projects. However, these estimates carry a degree of uncertainty (Kirkerud, et al., 2023). Despite the high costs, offshore wind projects may still attract investors due to superior wind conditions, which can result in higher energy yields.

Offshore wind is currently not subject to a resource rent tax. However, the potential for retroactively applying such a tax poses a significant risk. The substantial capital investments required for offshore wind means that the introduction of a resource rent tax could severely impact project value, increase financial uncertainty, and make future offshore wind projects less attractive to investors. This could, in turn, hinder Norway's ability to meet its energy production goals.

8.4.2 Resource rent on offshore wind

In our survey, we asked companies and analysts whether they believed the resource rent tax would encourage the development of offshore wind as an alternative. One analyst suggested that it might make offshore wind more viable, as it could prompt a search for alternative markets. However, other respondents, including both companies and analysts, pointed out that the tax might extend to offshore wind, introducing further uncertainty and potentially deterring investments.

The political debate over the introduction of a resource rent tax on offshore wind has further contributed to investor uncertainty, posing a risk to future energy production capacity. Høyre politicians Nicolai Astrup and Tina Bru have proposed an inquiry into the potential implementation of such a tax, arguing that it would be better to introduce it proactively rather than retroactively, as was done with onshore wind (Holter, 2024a). However, Minister of Energy Terje Aasland opposes this suggestion, stating that there is no need to conduct such an inquiry at this time (Holter, 2024b).

Åslaug Haga, CEO of Fornybar Norge, has expressed concern that the ongoing debate creates uncertainty about future project operating conditions (Haga, 2024). According to Haga, this uncertainty is undesirable at this stage of development. One perspective is that uncertainty is already discouraging investors and that implementing a resource rent tax now could provide clarity. On the other hand, introducing such a tax in a sector that may not generate resource rent for another decade, or at all, could further discourage investment in an already high-risk industry. This could, in turn, reduce the likelihood of achieving offshore wind energy production goals.

If the debate continues to dominate headlines without resolution, it risks undermining confidence in the offshore wind sector and delaying critical investments needed to meet Norway's energy production targets.

8.4.3 Effect on power balance

Norway's energy demand is expected to reach 163 TWh by 2030 and 191 TWh by 2040, according to NVE's *Long-term Power Market Analysis 2023*. Onshore wind is projected to add 1 TWh to the energy supply by 2030. Given that the projected power surplus for 2030 is estimated at just 1 TWh, the absence of new onshore wind production would eliminate Norway's energy surplus. Between 2030 and 2040, onshore wind production is projected to increase by 5 TWh, while the power surplus is expected to be 12 TWh by 2040. However, if no new onshore wind capacity is added by 2040, the energy surplus will be reduced to 6 TWh. This shows the critical role of onshore wind in maintaining Norway's power balance.

While onshore wind plays an important role, the future of offshore wind production is expected to have an even greater impact. Offshore wind is expected to add 1 TWh of production by 2035, which has a small impact on the power balance. However, from 2035 to 2040, production is projected to increase by 18 TWh, representing a substantial share of Norway's future power supply. With a forecasted power surplus of 12 TWh in 2040, any reduction in offshore wind production could shift Norway from an energy surplus to a deficit. While a complete halt in offshore wind production is unlikely, even a partial reduction could significantly alter the power balance.

8.5 Chapter Summary

This chapter examines the consequences of the resource rent tax on onshore wind farms, focusing on key areas such as policy risk, Norway's competitiveness as an investment destination, local acceptance, and the energy balance.

The government introduced the resource rent tax amid controversy, rushing its implementation and applying it retroactively, which disrupted the market and reduced investor confidence. Although some concerns were addressed through later revisions, uncertainty about stable operating conditions and political risks has become a major challenge for the industry.

The resource rent tax makes the wind power industry in Norway less competitive compared to Sweden, Finland, and Denmark. These countries offer lower corporate tax rates, more favorable property tax regimes, and no resource rent tax. The additional financial burdens in Norway, combined with political uncertainty, have led to divestments from foreign investors. This raises concerns about Norway's ability to attract capital in the future.

Local acceptance remains a significant bottleneck for onshore wind development in Norway. Municipalities significantly influence project approvals, often halting projects despite their financial benefits. While the resource rent tax allocates 50% of its revenue to municipalities, the lack of clarity in the distribution has limited its ability to enhance local acceptance. Studies show that the tax has only marginally improved support for wind projects, emphasizing the need for a more direct allocation of revenues to host municipalities to improve local acceptance.

The resource rent tax risks hindering the development of onshore wind capacity, jeopardizing Norway's ability to meet its growing energy demands. With the lack of new wind power installations and lengthy permitting processes, meaningful new onshore wind production is unlikely before 2030. Offshore wind is expected to play a critical role in meeting future energy needs. Although offshore wind is currently exempt from the resource rent tax, ongoing debates about its potential application could deter investors, delay vital projects, and consequently shift Norway's projected power balance from a surplus to a deficit.

9. Conclusion

9.1 Conclusion

This thesis examined the financial impact of the resource rent tax on future investments in the onshore wind industry and its consequences. We find that the resource rent tax without payouts has a slight negative impact on the profitability of future investment. However, if ESA approves government payouts, the tax substantially improves profitability. Regarding the consequences of the resource rent tax, it increases perceptions of political risk, creates uncompetitive operating conditions, and fails to improve local acceptance. Combined, these factors can slow down wind power development, causing Norway's energy balance to shift from a surplus to a deficit.

In the scenario without government payouts, the resource rent tax reduces the IRR from 6.3% to 6.1%. The tax limits the upside potential by capturing a portion of surplus profits in highly profitable scenarios, acting as a buffer that narrows the range of outcomes. In unprofitable scenarios, the tax has no effect, as it does not apply when profits fall below the tax threshold. The differences in power price required for an investment, with and without the resource rent tax, are relatively small, especially when compared to the natural variability in power prices. With the resource rent tax, the required power price is increased by approximately NOK 0.02/kWh. Although the impact of the tax is minimal, it further diminishes the financial viability of projects that are already struggling to meet the cost of capital requirements. However, the resource rent tax does not pose a financial barrier and should have a minimal effect on future investment activity from a financial perspective.

In the scenario where the government provides payouts, the resource rent tax increases the IRR from 6.3% to 7.4%. Although the tax reduces the upside potential by capturing a portion of surplus profits, the payout mechanism allows companies to receive compensation for negative resource rent taxes, limiting the downside in unprofitable periods. If the resource rent tax includes payouts, the required power price is reduced by approximately NOK 0.03/kWh, underscoring that the resource rent tax has a positive effect on profitability. From a financial perspective, this should drive higher investment activity.

The introduction of the resource rent tax has increased the perceived political risk associated with Norway. Additionally, it has reduced Norway’s competitiveness as an investment destination compared to other Nordic countries. This has led to a decline in international ownership and potentially reduced the country’s ability to secure necessary capital for new renewable energy projects.

Furthermore, the tax has failed to improve local acceptance, a key bottleneck for onshore wind development. There is also a potential spillover effect as there are concerns that the resource rent tax could eventually be implemented for offshore wind. This uncertainty about future regulatory conditions can stop new investments in the offshore wind sector, as investors are unsure of the framework governing their investments.

Combined, the tax's consequences pose a significant risk to the development of new wind power in Norway, potentially shifting the country's energy balance from a surplus to a deficit.

9.2 Suggestion for further research

Lastly, we highlight an additional aspect of the resource rent tax model that may influence future investments and, consequently, its implications. As this factor becomes more measurable over time, this chapter serves as a proposal for future research that could build upon this analysis.

9.2.1 Government payout of negative resource rent tax

An interesting follow-up to this study would be to examine whether the resource rent tax model, which includes payouts for negative resource rent taxes, leads to reduced cost of capital requirements for investors.

Under the tax scenario that includes government payouts for negative resource rent tax, the government acts as a co-investor by participating directly in both the gains and losses of wind power projects. In profitable years, the government collects a share of the surplus profits through taxation, ensuring that the society benefits from the resource rent. However, in years when the projects incur losses, the government compensates companies by providing payouts for negative resource rent taxes. This mechanism creates a risk-sharing structure between investors and the government, effectively reducing the overall risk borne by private investors. This risk-sharing has several implications for the financial dynamics of wind farm projects. By absorbing a portion of the downside risk, the government reduces the volatility of cash flows for investors, which in turn lowers the overall risk profile of such investments. A lower risk profile can potentially reduce the cost of capital, as investors and lenders are likely to require a smaller risk premium. As shown in the sensitivity analysis, the cost of capital is a key determinant of the financial viability of wind power projects.

The potential reduction in the cost of capital under this tax design means that a broader range of wind farm projects could become financially viable. Projects that might have been dismissed as too risky or marginally unprofitable under a higher cost of capital could now attract investment. This effect is particularly important in an industry where profitability is sensitive to variables such as electricity prices, load factors, and investment costs. The inclusion of government payouts for negative taxes can enhance the stability and predictability of returns, providing additional confidence to both equity investors and debt financiers.

Further research could involve conducting surveys targeting investors or quantifying the development of the industry's implicit risk premium while controlling for other relevant factors. Will we observe an increase in investment willingness in Norway as a result of the resource rent tax?

10. Appendix

10.1 Surveys and in-depth interviews

Parts of the data used in this thesis were obtained from two self-designed surveys conducted using the Qualtrics analysis tool. One survey was tailored for and completed by six different wind companies, while the other targeted five renewable energy analysts from five different brokerage firms. Respondents were allowed to provide open-ended responses in addition to structured questions.

Furthermore, the data was supplemented with digital and in-person semi-structured interviews. These interviews included experts from four different wind companies and a special auditor at the Norwegian Tax Administration.

10.1.1 Results from the survey sent to analysts

1. *Is the resource rent tax on wind power neutral or does it have a distorting effect on investment and operational activities? If so, how?*

    1.1. The retroactive resource rent tax was clearly negative (for many investors who no longer want to invest here). Structured as a pure cash flow tax, it will become (almost) neutral on NEW projects. Without a cash flow tax, it is not neutral. The problem with carryforward losses versus actual cash paid out is that you get a lower return on the carryforward loss than the market requires for equity returns.

    1.2. It is meant to be neutral, but it distorts investments until the payout mechanism is in place.

    1.3. Distorting effect, as it changes the IRR for investors due to the "delayed" payout of negative resource rent income associated with initial investments.

    1.4. Don't know.

    1.5. Negative - detrimental to investments and their net present value (NPV). Unlike oil, storage is not yet a proper alternative. Due to this, you are exposed to the cannibalization effect, zero hours, among other things. If you combine this with ground rent tax (at least without significant visible cash payments or tax transfers/carryforward losses), it destroys NPV.

2. *How do you think the reduced resource rent tax rate from 35% to 25% will impact investments by wind power companies?*

   2.1. The retroactive resource rent tax was clearly negative (for many investors who no longer want to invest here). Structured as a pure cash flow tax, it will become (almost) neutral on NEW projects. Without a cash flow tax, it is not neutral. The problem with carryforward losses versus actual cash paid out is that you get a lower return on the carryforward loss than the market requires for equity returns.

   2.2. It is meant to be neutral, but it distorts investments until the payout mechanism is in place.

   2.3. Distorting effect, as it changes the IRR for investors due to the “delayed” payout of negative resource rent income associated with initial investments.

   2.4. Don't know.

   2.5. Its positive, but if it is enough is another question.

3. *How are companies planning to manage the resource rent tax? Are they implementing new cost programs, reducing staff, or changing prices?*

   3.1. I think this will be minimally affected.

   3.2. No change.

   3.3. Generally speaking, there is a “pause” on the development of new wind farms in Norway, so for new projects, it's probably not the resource rent tax that is the main reason for the lack of new developments. Regarding existing farms, there is relatively little they can do. Cost-saving programs have little effect since these are things they would have controlled anyway, and the number of employees is typically related to the operation of the parks, and that need will probably not change. So the effect is lower cash flow to the owners.

3.4. Haven’t heard anything about this. Of the listed companies, only Cloudberry was affected by this. They haven’t made any organizational changes as a result.

3.5. The only current options are to secure higher offtake prices, plus bring service and equipment providers into the project planning phase earlier. These will likely need to be done in combination.

4. *Do you think the resource rent tax will deter new entrants from entering the market?*

4.1. The sudden introduction clearly scared off many players. We've seen several (especially foreign investors) sell off their Norwegian power assets.

4.2. Maybe—changes in tax rules are a risk factor.

4.3. Definitely. Now that it’s in place, so to speak, the cat's out of the bag, and one could say the risk of sudden implementation is gone—you can factor it into the calculations. However, it is still possible for future governments to change the tax rate. So even though it's now 25%, a new left-leaning majority government could raise it to 45% or 70% if they get enough support in Parliament. This is a major risk factor for projects that already have a low IRR.

4.4. No, political stability is needed. As long as there is no uncertainty around the framework conditions, new entrants will come.

4.5. Yes, definitely, companies have a capital discipline responsibility towards shareholders and must be able to make projects financially viable.

5. *Do you think the resource rent tax will cause existing players to exit the market?*

5.1. Yes, we’ve seen that.

5.2. Yes, because the compensation for investments made before 1/1/2024 is considered insufficient.

5.3. Yes, just look at BlackRock.

5.4. If existing players only had access to projects that were no longer profitable, they would leave the market. However, I don't think that's the case.

5.5. Potentially

6. *Do you think the resource rent tax will encourage a shift towards developing offshore wind?*

6.1. No. In many ways, the risk is even greater here (could there be a resource rent tax? Suddenly… with retroactive effect—without compensation).

6.2. No.

6.3. Offshore and onshore wind have two completely different cost profiles and require different development competencies. Additionally, offshore wind in Norway is already limited by access to land areas, so I don't think it will have a large direct effect on the positive side. On the negative side, the introduction of a resource rent tax on onshore wind could actually be a risk factor for Norwegian offshore wind projects, as it could suddenly be introduced after parks are operational, thereby "expropriating" a portion of the owners' cash flow.

6.4. No.

6.5. Potentially, or position themselves for other markets.

7. *If the resource rent tax were set at 35% instead of 25%, would it change any of your previous answers? If so, how?*

7.1. No. Cash flow tax is the most important factor.

7.2. No.

7.3. Nothing other than that the willingness to invest would be even lower again, as the IRR would drop further for owners. Alternatively, contract prices would have to rise significantly.

7.4. No, stability is all that’s needed, and the tax will be what it is.

7.5. No

8. *From an analyst's perspective: Has investor interest in Norwegian wind power companies changed significantly as a result of the introduction of the resource rent tax on wind power?*

8.1. No—it hit hard for the projects that were operational and were taxed retroactively. Now it matters less (it was priced in immediately).

8.2. Yes—there is a general misunderstanding of what a cash flow tax entails. (There is also a general lack of understanding of what tax and deductions in general entail, but that’s another matter).

8.3. Partly, but we have very limited listed exposure to Norwegian wind power. But there are bonds.

8.4. No.

8.5. Yes

9. *If investor interest has changed, how is this expressed? Comment briefly. If no observed change in interest, comment “n.a.”*

9.1. n.a.

9.2. The investor comment would be: “It’s less interesting to own companies with exposure to Norwegian wind power when the tax increases.”

9.3. n.a.

9.4. n.a.

9.5. Dont want to discuss Norwegian wind projects

10. Do you use the CAPM/WACC method to calculate the discount rate?

10.1. Yes.

10.2. I don’t understand the question.

10.3. Yes, country-specific CAPM, but with our own assumptions on beta.

10.4. No.

11. What range does the discount rate you use for onshore wind power projects fall within?

11.1. 6-7% (in Norway).

11.2. 8-9%.

11.3. For equity, our range is 8.5-10.5%, as it must compete with other publicly traded stock returns in the sector.

11.4. 7%.

12. Do you use specific discount rates for tax elements such as interest deductions, depreciation, and carryforward losses when valuing wind power companies?

12.1. No.

12.2. No.

12.3. We value equity by using cash flow to equity, not to EV. This is because the loan repayment profiles are typically given, and revenues and costs are fairly easy to estimate (on average, given known average wind conditions, prices, and operating costs).

12.4. No. This is accounted for in the estimates.

12.5. Yes

13. *The Ministry of Finance believes that the tax deductions in the resource rent tax are so secure that they can be discounted with a risk-free rate. Do you agree with this statement? Comment briefly.*

13.1. No investor views a cash flow as secure. The resource rent came overnight for wind (can the answer become more clear?).

13.2. No—this is not reflected in companies' financing costs (e.g., with banks).

13.3. Absolutely not. Equity investors never invest in risk-free financial instruments—that's what bond investors do. So, for a project owner, you could say it's a very secure cash flow, but the alternative is to invest in a broadly diversified stock portfolio—which will always give a higher return over time than the risk-free rate.

13.4. If the government says you'll definitely get tax deductions, then you have to factor that in, yes.

13.5. No

14. *Have you made any changes to the discount rate(s) as a result of the introduction of the resource rent tax?*

14.1. We didn't cover any companies with significant exposure to Norwegian wind before the tax was implemented.

14.2. No.

14.3. No. It only affects cash flow. But one could argue that the risk premium should increase due to the possibility of future rate hikes.

14.4. No, there are so many other uncertainties in the projects we analyze (most onshore wind projects in Norway owned by publicly traded players are exposed to spot prices today), so that’s not what breaks the deal.

14.5. Don’t value Norwegian onshore wind companies.

15. *Is partial constant cash flow discounting a method you use in the valuation of various wind power projects?*

15.1. No.

15.2. No.

15.3. Never heard of it. If you mean DCF to equity, then that’s what we do.

15.4. No.

16. *Do you think the resource rent tax will have a net positive impact on the local community? Feel free to comment why.*

16.1. It depends entirely on how the funds raised are distributed. The best thing for local communities is for the Ministry of Petroleum and Energy to allow all municipalities that want to build wind farms to do so. In many places, there is a desire for wind power, but the ministry says no. In many cases, the local community loses out on millions in lease income.

16.2. The structure should provide greater revenues to the municipalities where the wind power is located. However, it’s tempting to think that in the next round, this will result in lower (means-tested) transfers to the same municipalities. So my conclusion is perhaps—maybe.

16.3. Yes and no. It will obviously be positive for the municipalities with existing power plants, as they will receive a share of (the expropriated) tax, while they may not have wanted new projects in their areas anyway. For new projects, it will be negative from an economic standpoint, as projects will be shelved due to the tax.

16.4. It's too political; I don't know.

16.5. Yes, potentially more revenue if projects are carried out, but since they are not, the effect is zero.

10.1.2 Results from survey to companies

1. *Is the resource rent tax on wind power neutral, or does it have a distorting effect on investment and operational activity? If so, how?*

1.1. The tax was implemented on existing wind power in a way that was not investment neutral. The tax is a form of expropriation without compensation.

1.2. It is theoretically neutral, but not when using the normal discount rates used by the industry.

1.3. The resource rent tax is not neutral, as it is not definitively clear that a negative resource rent will be paid out at the time of investment. Additionally, there are several costs that are not deductible under the resource rent tax.

1.4. Neutral on new investments. Very negative on existing ones. It increases political risk, and thus, investors demand higher returns for investments in Norway.

1.5. The resource rent tax affects investment incentives for new wind power. All else being equal, the taxation will yield lower returns for investors

1.6. It significantly lowers the internal rate of return on projects and is not neutral. The resource rent tax reduces the feasibility of establishing wind power in areas with moderate wind resources

2. *How do you think the reduced resource rent tax rate from 35% to 25% will affect wind power companies' investments?*

    2.1. Less is less, but 25% is still a lot. Wind power is a low returns business in most cases. For the green transition, and considering that investments are part of a global competition for allocation of capital, 25% is too much when other countries are subsidizing investments in green tech.

    2.2. It provides better profitability and a lower break-even price (given a 6-7% discount rate) for typical wind power projects in Norway.

    2.3. This will have a positive effect and counteract some of the negative impact of the tax introduction.

    2.4. Neutral on new investments. Marginally better for existing ones (still highly value-destructive).

    2.5. It will become easier to attract investors, but investors are likely to “price in” changing tax regimes into their assessments, so projects must be better than before, regardless of the tax rate.

    2.6. A bit better, it becomes difficult to realize projects with both, but 35% makes it especially challenging since development costs and land costs cannot be depreciated against the resource rent.

3. *How are you planning to handle the resource rent tax? Are they implementing new cost programs, reducing the number of employees, or changing prices?*

    3.1. We will never invest in Norway again.

    3.2. Wind power projects in Norway still have decent profitability, and the short-term impact among developers doesn't seem to be changing. Efforts are currently focused on gaining municipal approval for wind power projects across the country. Owners of existing parks are dissatisfied with the tax introduction, but publicly owned companies have been cautious in their criticism.

3.3. Not sure.

3.4. Capital is flowing out of Norway. Investing in other countries.

3.5. I have no knowledge of this…

3.6. No plans, it is a long way until investment decisions, maybe one hopes it will disappear in a few years if one cannot make investment decisions. It may become relevant to stop development activities in Norway

4. *Do you believe the resource rent tax discourages new entrants from entering the market?*

4.1. Yes.

4.2. Yes, there is a reduced willingness to invest from foreign investors, mainly due to increased political uncertainty. Many were caught off guard by the introduction and are very dissatisfied with how it was implemented.

4.3. Yes. The sudden introduction of the resource rent tax has damaged trust in the Norwegian market, causing foreign investors to hesitate before investing. Particularly damaging to trust has been the fact that the resource rent tax was applied to already developed projects.

4.4. Yes

4.5. Yes

4.6. Yes, the resource rent tax makes it less attractive for new players, especially foreign ones.

5. *Do you think the resource rent tax will cause existing players to exit the market?*

5.1. Yes, and it already has.

5.2. Yes, that is already evident.

5.3. Yes, several foreign companies have sold their stakes in Norwegian wind power over the past year and are unlikely to return for many years.

5.4. Yes

5.5. Yes

5.6. Yes, in the long term, also in combination with resistance. Several of the foreign players have probably already left the market.

6. *Do you think the resource rent tax will encourage the development of offshore wind instead?*

6.1. No. There is no reason why such tax wouldn't be put on to offshore as well as soon as the investments are operational. Offshore is also very expensive compared to onshore.

6.2. No, offshore wind in Norway is still unprofitable and reliant on subsidies.

6.3. No, I don't think this is related. Many will likely consider it uncertain whether a resource rent tax will be introduced for offshore wind if it becomes profitable in the future.

6.4. No. There's a risk that it will be introduced there as well.

6.5. No – no assets are exempt from some form of resource rent, including offshore wind.

6.6. No, uncertainty has been created in the market. Offshore wind developers may also risk value confiscations from the state; the ground rent tax could also apply there. I believe it has the opposite effect, making renewable investments in Norway less attractive.

7. *If the resource rent tax were set at 35% instead of 25%, would it change any of your answers above? If so, how?*

7.1. The effective tax rate for the resource rent is 25%, not 35%. However, the lower the tax rate, the better.

7.2. No

7.3. No

7.4. No

7.5. No

7.6. Everything is getting worse for us, and we will move more quickly toward winding down activity.

8. *Do you use the CAPM/WACC method to calculate the discount rate?*

8.1. We use CAPM to calculate the cost of equity that is then used to discount cash flows to equity

8.2. It’s one of the methods used.

8.3. Yes

8.4. No

8.5. WACC

8.6. Well, not sure what it's called, but we have a professional finance department

9. *In what range does the discount rate you use for onshore wind power projects fall?*

9.1. We use currently a discount rate of approximately 9.0% for a wind project in Norway. Discount rates are country and asset specific

9.2. 6-8%

9.3. 6-8%

9.4. n.a.

9.5. We do not disclose the discount rates we use

9.6. 6.5-7.5%. The discount rate does not reflect the risk in our development projects in any way. There is very high uncertainty associated with conducting wind power development in Norway!

10. *Do you use separate discount rates for tax elements such as interest deductions, depreciation, and carryforward losses when valuing wind power companies?*

10.1. No, these are valued through their impact on the cash flows to equity

10.2. No

10.3. No

10.4. The tax elements are included in the calculation of cash flow.

10.5. Not valuing wind power companies

10.6. n.a.

11. *The Ministry of Finance believes that the tax deductions in the resource rent tax are so secure that they can be discounted at a risk-free rate. Do you agree with this statement? Please comment briefly.*

11.1. I don’t think that would be correct (at least from our perspective). Tax deductions can only be used against future profits and these by nature are uncertain

11.2. No, that’s too theoretical. Banks won’t lend money at a risk-free rate, so the actual financing costs will be higher.

11.3. Not sure

11.4. No. It's ridiculous that the cash flow isn't paid out immediately. We are not a bank.

11.5. Nothing from the Ministry of Finance is certain.

11.6. This is just nonsense! One may risk paying ground rent even in years with low electricity prices and deficits, because the resource rent does not contribute to covering land lease costs

12. Have you made changes to the discount rate(s) as a result of the introduction of the resource rent tax?

12.1. No, its value impact is reflected by the expected future cash flows

12.2. No, more du to increased interest rates

12.3. No

12.4. Yes, increased in Norway compared to earlier

12.5. Yes

12.6. This becomes a hypothetical question, as we are not working on investment decisions in Norway at the moment (no concessions).

13. Is partial cash flow discounting a method you use in the valuation of various wind power projects?

13.1. No, we value cash flows to equity and there is only one discount rate for the project

13.2. No

13.3. No

13.4. No

13.5. No

13.6. n.a.

14. *How does the resource rent tax affect local labor demand? Are companies reducing their demand for workforce?*

14.1. People have been employed from wind power construction. Construction of new onshore will slow down or stop.

14.2. No, they are not looking for jobs elsewhere. Wind power in Norway is still profitable; the challenge lies in the political processes and obtaining local approval.

14.3. Not sure

14.4. Uncertain

14.5. No

14.6. We have a small development department in Norway, so not many to lose. The resource rent tax definitely makes it less relevant to hire new employees.

15. *Are current or potential new employees aware that this could negatively impact the company, and are they therefore seeking jobs elsewhere?*

15.1. We will make investments in other countries. Our employees will not be impacted by the change.

15.2. Does not seem that way.

15.3. Uncertain

15.4. It will affect the service industry, if projects aren't built in Norway. However, this is primarily influenced by permits

15.5. No

15.6. Well, we have a wind power plant and are trying to operate it as efficiently as possible. The resource rent tax doesn't have much impact on the operations.

16. *Do you think the resource rent tax will have a net positive impact on the local community? Please comment on why.*

16.1. If by local you mean Norway, then no. The income is marginal and the lack of investments into renewables will lead to an electricity deficiency, which will be very expensive for Norway.

16.2. Yes, but it's marginal. There is little resource rent in wind power, as assessed by SSB. Additionally, many power companies are already publicly owned, meaning dividends go to the government anyway. Now, it potentially comes via taxes. Furthermore, a production fee has been introduced, which can be deducted from the resource rent tax on a one-to-one basis, reducing the impact of the resource rent tax.

16.3. What would be positive for the local communities is securing predictable income from wind power. However, I am unsure whether a state tax redistributed to municipalities afterward is perceived as that security.

16.4. No. It is very negative for Norway's international standing that we are introducing retroactive taxes. International capital is withdrawing, and the Norwegian krone(NOK) is weakening significantly. What reason do foreigners have to bother owning the krone and investing in Norway...?

16.5. No

16.6. Increased revenues for the local community are important. State revenues should matter, but I don't think this has a significant impact on public opinion.

10.2 Net present value and internal rate of return

The Net Present Value (NPV) method is based on the principle of present value. This fundamental economic concept states that one unit of currency today is worth more than the same amount in the future due to two key factors: 1) the time value of money, and 2) the risks and uncertainties associated with future payments. The time value of money reflects the idea that money today has greater value because it can be invested to generate returns. Additionally, the inherent uncertainty of the future means that having money in hand today is preferable to waiting for potentially uncertain future payments.

The NPV approach is a classic investment valuation method grounded in the present value principle. The value of an investment is calculated as the present value of all incoming and outgoing cash flows over the project's lifespan. To account for the opportunity cost of tying up funds in the project, future cash flows are discounted using the cost of capital. This approach ensures that the time value of money and the risks investors are willing to accept are appropriately factored into the valuation.

The Internal Rate of Return (IRR) is the discount rate at which the NPV of a project equals zero. In other words, it is the rate at which a project's discounted cash inflows and outflows break even. IRR is also referred to as the marginal return requirement or hurdle rate.

10.3 Calculation of items in the cash flow analysis

Below are excerpts of intermediate calculations for items in the cash flow.

Resource rent	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
Revenue	0	0	130	123	116	109	102	95	91	67	67	67	67	67	67
Opex	0	0	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22
Property tax	0	0	-3	-3	-3	-3	-3	-3	-3	-1	0	0	0	0	0
Særlig beregnet selskapsskatt	0	0	-4	-6	-8	-8	-9	-9	-9	-9	-9	-9	-10	-10	-1
Capex	-350	-350	0	0	0	0	0	0	0	0	0	0	0	0	0
Resource rent	-350	-350	101	92	84	76	69	62	58	36	36	36	36	36	44
Resource rent tax	-112	-112	32	29	27	24	22	20	19	11	11	11	11	11	14
Deduction of production fee	0	0	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
Resource rent tax with payouts	-112	-112	29	26	23	21	18	16	15	8	8	8	8	8	10
Resource rent tax without payouts	0	0	0	0	0	0	0	0	0	0	3	8	8	8	10
Paid resource rent tax with payouts	0	0	-209	26	23	21	18	16	15	8	8	8	8	8	10
Deffered tax without payouts	-117	-237	-217	-198	-181	-167	-154	-143	-133	-5	0	0	0	0	0
Deffered tax with payouts	-117	-237	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 37 - Calculation of resource rent tax with and without governmental payouts of negative taxes

Tax payable	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
Opening value of wind park group d	280	504	403	323	258	206	165	132	106	2	2	1	1	1	1
Depreciation group d (80%)	56	101	81	65	52	41	33	26	21	0	0	0	0	0	1
Closing value of wind park group d	224	403	323	258	206	165	132	106	85	2	1	1	1	1	0
Opening value of wind park other groups	70	137	132	126	121	117	112	107	103	49	47	46	44	42	40
Depreciation other groups (20%)	3	5	5	5	5	5	4	4	4	2	2	2	2	2	40
Closing value of wind park other groups	67	132	126	121	117	112	107	103	99	47	46	44	42	40	0
Revenue	**0**	**0**	**130**	**123**	**116**	**109**	**102**	**95**	**91**	**67**	**67**	**67**	**67**	**67**	**67**
Lease	0	0	-5	-5	-5	-4	-4	-4	-4	-3	-3	-3	-3	-3	-3
Opex	0	0	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22
EBITDA	**0**	**0**	**103**	**96**	**90**	**83**	**76**	**69**	**66**	**43**	**43**	**43**	**43**	**43**	**43**
D&A	-59	-106	-86	-70	-56	-46	-38	-31	-25	-2	-2	-2	-2	-2	-41
EBIT	**-59**	**-106**	**17**	**27**	**33**	**37**	**38**	**38**	**41**	**40**	**41**	**41**	**41**	**41**	**2**
Interests	0	-15	-15	-14	-14	-13	-13	-12	-12	-3	-2	-2	-1	-1	0
Pre tax profit	**-59**	**-121**	**2**	**12**	**19**	**24**	**26**	**26**	**29**	**37**	**38**	**39**	**39**	**40**	**1**
Tax payable	-13	-27	1	3	4	5	6	6	6	8	8	9	9	9	0
Paid tax	0	0	0	0	0	0	0	0	0	8	8	9	9	9	0
Deffered tax	-13	-41	-42	-41	-38	-34	-29	-24	-19	0	0	0	0	0	0

Figure 38 - Calculation of paid tax

Property tax modelling	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
B.o.p. value of wind park	350	689	667	645	622	600	578	556	533	133	111	89	67	44	22
Depreciation	11	22	22	22	22	22	22	22	22	22	22	22	22	22	22
E.o.f value of wind park	339	667	645	622	600	578	556	533	511	111	89	67	44	22	0
Property tax	2	3	3	3	3	3	3	3	3	1	0	0	0	0	0

Figure 39 - Calculation of property tax

Special calculated corporate tax	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
Revenue	0	0	130	123	116	109	102	95	91	67	67	67	67	67	67
Opex	0	0	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22
D&A	-59	-106	-86	-70	-56	-46	-38	-31	-25	-2	-2	-2	-2	-2	-41
Property tax	-2	-3	-3	-3	-3	-3	-3	-3	-3	-1	0	0	0	0	0
Taxable income	-60	-110	19	28	35	38	40	40	42	43	43	43	43	43	4
Special calculated corporate tax	**-13**	**-24**	**4**	**6**	**8**	**8**	**9**	**9**	**9**	**9**	**9**	**9**	**10**	**10**	**1**
Paid tax															
Deffered tax	-13	-39	-36	-31	-24	-16	-8	0	0	0	0	0	0	0	0

Figure 40 – Calculation of special calculated corporate tax

Debt	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
Debt b.o.p		245	237	229	221	213	205	198	190	47	40	32	24	16	8
Repayment of debt		8	8	8	8	8	8	8	8	8	8	8	8	8	8
Interests		15	15	14	14	13	13	12	12	3	2	2	1	1	0
Debt e.o.p		237	229	221	213	205	198	190	182	40	32	24	16	8	0

Figure 41 - Calculation of interest payments and debt repayment

EBITDA calculation	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
Revenue			**130**	**123**	**116**	**109**	**102**	**95**	**91**	**67**	**67**	**67**	**67**	**67**	**67**
Lease			-5	-5	-5	-4	-4	-4	-4	-3	-3	-3	-3	-3	-3
Opex			-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22	-22
EBITDA			**103**	**96**	**90**	**83**	**76**	**69**	**66**	**43**	**43**	**43**	**43**	**43**	**43**

Figure 42 - Calculation of EBITDA used in cash flow

Capture price	1	2	3	4	5	6	7	8	9	27	28	29	30	31	32
Power price NOKm/GWH			0.80	0.76	0.72	0.67	0.63	0.59	0.57	0.42	0.42	0.42	0.42	0.42	0.42
Capture rate			97%	97%	97%	97%	97%	97%	97%	96%	96%	96%	96%	96%	96%
Realized power price NOKm/GWH			0.78	0.74	0.70	0.65	0.61	0.57	0.55	0.40	0.40	0.40	0.40	0.40	0.40

Figure 43 - Calculation of realized power price

Unit	Definition	Contextual Example
Kilowatt (kW)	1,000 watts	A rooftop solar panel typically has a capacity of 1-5 kW
Megawatt (MW)	1,000 kW or 1 million watts	A single wind turbine typically have a capacity of 2-5 MW
Gigawatt (GW)	1,000 MW or 1 billion watts	A large hydropower plant in Norway has a capacity of ~1 GW
Terawatt (TW)	1,000 GW or 1 trillion watts	Global electricity capacity is measured in TW
Kilowatt-hour (kWh)	1 kW for 1 hour	An average Norwegian household consumes about 20,000 kWh per year
Megawatt-hour (MWh)	1,000 kWh	1 MWh powers an average Norwegian household for about 18 days
Gigaawatt-hour (GWh)	1,000 MWh or 1 million kWh	1 GWh powers approximately 50 Norwegian households for an entire year
Terawatt-hour (TWh)	1,000 GWh or 1 billion kWh	1 TWh powers approximately 50,000 Norwegian households for an entire year

Figure 4421 - Overview of units and contextual examples

Declaration on the use of AI tools in the work on this master's thesis

Name (and version) of the AI tool: ChatGPT, 4.0.
Purpose of using the tool: The purpose of using the tool is to enhance the clarity and quality of the text.

[I am/we are] aware that [I am/we are] responsible for all content of this master's thesis, including the parts where AI tools are used. [I am/we are] responsible for ensuring that the thesis complies with ethical rules for privacy and publication.

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