P4SD

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FIELD LAB IN PARTNERSHIP FOR SUSTAINABLE DEVELOPMENT

SKAGERAK ENERGI: BALANCING STRATEGIC GROWTH AND SOCIAL ACCEPTANCE IN NORWAY'S RENEWABLE ENERGY SECTOR

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ABSTRACT

This work consists of three parts: case study, consultant report, and teaching notes as a supplement to the case. As the global push for renewable energy increases, Skagerak Energi faces challenges in scaling production while ensuring social acceptance. Social acceptance is vital across socio-political, community, and market dimensions for the successful deployment of renewable energy, yet it remains a significant barrier. This paper identifies strategies to address knowledge gaps, build trust through strategic partnerships, and highlight economic benefits, aiming to foster social acceptance for renewable energy projects.

Key words: Renewable energy, social acceptance, onshore wind, solar energy, energy diversification, Norwegian energy sector, strategic growth, Strategic Decision-Making, State ownership.

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CASE STUDY

SKAGERAK ENERGI - SEARCH FOR SUSTAINABLE GROWTH

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BOARD MEETING, SPRING 2022

In spring 2022, the board of Skagerak Energi, a regional renewable energy company in Norway, gathered to discuss the significant decision regarding the company's next strategic move. Although Skagerak Energi generated most of its energy from hydropower, the company recognized that relying solely on hydropower would not suffice to meet its ambitious growth targets in the rapidly changing energy landscape.

Norway's waterways had largely been developed for hydropower, leaving limited opportunities for further expansion. Consequently, the need to explore alternative renewable energy sources became critical, prompting Skagerak Energi to reassess its strategy and seek new opportunities for sustainable growth.

To achieve their growth goals, the board had to consider different growth strategies, and the key question was where to invest: Should they focus on *solar energy,* with its increasing potential but high upfront costs? Could they leverage *wind energy*, despite the challenges facing resistance from local communities? Should they consider the possibilities of *nuclear energy*, which promises powerful output but has high investment costs, long development timelines, and need for a robust national infrastructure? Each option held both opportunities and obstacles, and the board's decision would shape Skagerak Energi's place in the energy market of the future.

SKAGERAK'S STRATEGIC SHIFT IN 2019

In 2019, Skagerak Energi adopted a new strategy, shifting its focus from optimizing hydropower solely to pursuing broader growth through energy diversification. This shift supported Norway's ambitious climate goals, which again was aligned with EU's target to increase the share of renewable energy consumption from 23% in 2022 to at least 42.5% by 2030 (Exhibit 1). The energy demand in Norway was expected to increase from approximately 140 TWh in 2020 to over 190 TWh by 2040, driven by electrification, industrial growth, and hydrogen production (Haukeli et al. 2021). This highlighted the urgency of expanding renewable energy capacity to meet future needs (Exhibit 2).

2019-2021: REGULATORY SHIFTS AND MARKET VOLATILITY

Between 2019 and 2021, Skagerak Energi encountered significant external challenges shaped by regulatory shifts and market volatility.

Regulatory Changes

In 2019, Norwegian municipalities were granted greater control over wind power concessions, which complicated project approvals and increased local opposition. This change allowed local communities to play a more active role shaping the future of onshore wind energy projects, but also introduced new challenges for energy firms. This was particularly evident in areas where Sámi reindeer herding intersected with wind farm development. Controversies such as the Fosen wind park exemplified this; the Sámi community claimed that the 151 wind turbines disrupted reindeer migration and grazing areas, thereby violating their indigenous rights. The case reached the Supreme Court which ruled in favor of the Sámi community, stating that the turbines were a breach of human rights. This decision emphasized that even the benefits of renewable energy could not outweigh the protection of indigenous rights and local interests.

In response to such conflicts, stricter regulations were introduced, placing greater emphasis on Sámi institutions such as the Sámi Parliament in the concession process. Combined with growing environmental and social resistance, these developments led to a three-year halt on new wind power projects starting from April 2019. For Skagerak Energi, this evolving regulatory and social landscape made it significantly challenging to develop and expand onshore wind energy. At the same time, these challenges raised broader questions: If wind energy faced such strong opposition, could other renewable energy sources, such as solar power, encounter similar challenges?

Market Volatility

In 2020, the COVID-19 pandemic, combined with heavy rainfall and warm temperatures, drove energy prices in Southern Norway to a 20-year low. There was lower demand than usual and because of the heavy rainfall, the energy supply was above average, resulting in a 75% drop in Skagerak Energi's annual profit (Exhibit 5). Conversely, in 2021, drought and colder temperatures reversed this trend, pushing demand up while drought conditions limited production. This resulted in high energy prices and a record high revenue equal to 567M Euro (Exhibit 5), illustrating the volatility in the renewable energy market.

Norway's power market is connected to Europe through interconnector cables, linking it to a continent still reliant on fossil fuel energy – Europe's total energy supply was based on 70,5% of fossil fuels (IEA 2022). When gas prices spiked dramatically autumn 2021, electricity prices followed. "Electricity prices rose to such heights that not only customers but also the power industry found the prices uncomfortably high" (Skagerak Energi 2022).

While Skagerak Energi had benefited from higher electricity prices on occasion, the company remained committed to supporting Norway`s goal of expanding renewable energy production by being a state-owned entity. "The demand for electricity must be supported by more new production – more power generation needs to be built in this country" (Skagerak Energi 2022). Furthermore, Skagerak`s CEO emphasized the importance of long-term growth and sustainability, noting that relying on market fluctuations and occasional spikes in demand is not a viable strategy for maintaining competitiveness. These challenges reflected broader industry trends, where companies were increasingly required to navigate a complex balance of local acceptance, regulatory compliance, and market adaptability.

SKAGERAK ENERGI AND THE RENEWABLE ENERGY SECTOR IN NORWAY

Founded in 2001, Skagerak Energi has its roots in Norway's early hydropower development, dating back to 1885 with the establishment of Norway's first hydropower plant in Skien. Skagerak Energi is among the top 20 largest energy companies in Norway, leading in the Southeast region. For nearly a century, the company had delivered renewable energy to the market. As a regional rooted company, Skagerak Energi was committed to providing energy supply, maintaining strong connections with local communities, and actively contributing to societal development, with a particular focus on environmental responsibility. Skagerak Energi operated through three key subsidiaries that collectively supported its renewable energy objectives, where Skagerak Kraft AS was the subsidiary responsible producing renewable energy (Exhibit 3).

Skagerak Energi is a state-owned enterprise. Statkraft, a company governed by the Ministry of *Trade, Industry and Fisheries* which holds a 67% stake, the remaining 33% is collectively owned by the three local municipalities of Skien, Porsgrunn, and Bamble (Skagerak Energi, n.d.).This ownership structure was typical for the Norwegian energy sector, particularly in the context of hydropower, where 88% of the plants are state-owned. In contrast, two-thirds of the country's wind energy was controlled by international investors (NVE 2019).

Given this context, developing new renewable energy projects in Norway is not just a matter of strategic planning; it also requires navigating a complex landscape of regulations and local dynamics. Establishing a new power station involves, first, conducting extensive spatial research to identify suitable land areas. A complex process, requiring careful consideration of factors such as quality of the power grid, social acceptance, natural resources and biodiversity. Secondly, when a suitable site is identified, one would need to negotiate with the landowner, who may have multiple competing inquiries. Thirdly, once an agreement with the landowner is reached, the company must obtain a government concession to begin energy production on the selected site. This final step is highly complex and requires approval from multiple stakeholders, including the local community, municipal authorities, and state regulators, each playing a critical role determining the project's viability. This process is lengthy, time from internal decision to start of construction often exceeds several years (Exhibit 12).

COMPETITIVE LANDSCAPE

Governmental ownership and concessions, some of which were granted over 100 years ago, have positioned Skagerak Energi as a strong player in the renewable energy market. Although it remains a smaller, regional company compared to larger peers like its parent company Statkraft and other national players such as Aleo Solar Fred. Olsen and Windcarrier, Skagerak holds a significant market share. Skagerak accounts for 3.8% of the national energy market and maintains a strong presence in the southeast region of Norway, where its strategic focus is to compete locally rather than with providers in other regions, such as Agder Energi or Eviny.

Although Skagerak appears to occupy a dominant position in the region, the internal strategy department highlighted the importance of not underestimating the potential competitive landscape, including both domestic and international players. The threat of low energy prices from overproduction in other countries could make it harder for Skagerak to stay profitable. For example, Denmark, with its significant wind energy capacity, often produced more electricity than it consumed during high-wind periods. This surplus could flow into shared energy markets, creating an oversupply, driving prices down. Similarly, solar energy surpluses from southern Europe during peak production seasons can also influence market prices.

The renewable energy sector's high capital requirements and complex concession processes create substantial entry barriers, making it difficult for new competitors to enter the market. Furthermore, Skagerak faces competition in the acquisition of land for its renewable energy projects. To develop new projects, the company must acquire or lease suitable land for the development of power plants. Once suitable areas have been identified, Skagerak must still secure approval from landowners, who may receive multiple offers from various stakeholders. This presents a second layer of competitors; entrepreneurs, tourist centers, farmers, industrial players and cottage developers may also be interested in the same land, thereby further complicating the process and increasing the competitive rivalry.

SOCIAL ACCEPTANCE AND THE DOUBLE-EDGED NATURE OF STATE OWNERSHIP

Social acceptance played a pivotal role in the successful execution of Skagerak Energi's growth strategy. As a state-owned entity, the company's long-standing presence and reputation for reliability gave Skagerak Energi a competitive edge in establishing trust with stakeholders. However, this reputation also meant increased public scrutiny, particularly regarding environmental impacts and the rights of local communities, including indigenous groups such as the Sámi people. In this case, Skagerak must navigate the socio-political landscape with great care, ensuring that to address the concerns of these communities to maintain its social license to operate.

"This is an industry where we are largely influenced by what happens around us [...] It is not like other products where you can increase sales with some marketing. Here, it is always about what society needs. They don't really care if it comes from us or someone else. They just want reliable and secure electricity, as cheap as possible – and preferably without using nature to make it happen."
- Head of Strategy Development, Skagerak Energi Kraft (Power Department)

The concession process, granting municipalities significant influence over local energy projects, underscored the importance of building public trust and fostering strong community engagement. Municipalities benefit directly from renewable energy development through tax revenues and concession fees, but these mechanisms alone did not always suffice to overcome societal resistance in sensitive areas. For Skagerak Energi, gaining public trust would require continuous dialogue with local communities, transparent environmental practices, and a commitment to addressing stakeholder concerns, especially in regions where social or environmental objections could delay or derail new projects.

Successful examples of addressing these challenges could be found in other countries. In Denmark, community wind projects had significantly reduced opposition to renewable energy developments by offering local citizens ownership shares in wind farms. This fostered a sense of purpose and ensured that communities directly benefited from renewable energy projects through dividends or reduced electricity costs (Ben Martin 2017).

EVALUATING THE ENERGY OPTIONS FOR SKAGERAK ENERGI'S GROWTH

As the board convened to determine where to focus Skagerak Energi's growth, several options emerged for consideration. Each presented unique opportunities and challenges, requiring a thorough evaluation of financial, environmental, and social factors to identify the most viable path forward.

Solar Energy - Growing Potential with Seasonal Limitations

Solar energy represented a viable option for Skagerak Energi driven by recent cost reductions from technological advancements and economies of scale (Jones-Albertus et al. 2018). Although the average levelized cost of energy (LCOE) for solar plants was around 5.55 cents per kWh (

Exhibit 7), slightly higher than hydropower and onshore wind, it remained competitive compared to offshore wind and nuclear energy. LCOE is a key metric for comparing different energy technologies, as it measures the cost per unit of energy produced (Corporate Finance Institute, n.d.). Since it is calculated on a per kWh basis, LCOE provided a standardized way to evaluate projects and technologies, regardless of their scale (MW) or lifespan (Exhibit 6).

Solar installations were scalable and relatively quick to deploy, making them an appealing option for immediate growth. However, the Norwegian winter restricted the effectiveness of solar energy, delivering a capacity factor of just 11% (Exhibit 6). On average, Norwegian solar installations produced only 11% of their peak annual output. In comparison, the capacity factor for solar power in the US was 25% (U.S. Department of Energy 2020). Low production period typically corresponded with peak energy demand, which drives energy prices up. Energy storage technology (e.g., batteries) or hybrid systems would been necessary to make solar energy viable throughout the year. An advantage for Skagerak was the opportunity to integrate solar with its existing hydropower infrastructure. By leveraging hydroelectric plants for storage capacity**,** Skagerak could balance solar energy's intermittency, making it a reliable energy source year-round. This synergy could optimize renewable energy production, but financial investments in storage and hybrid systems are still required.

In contrast to wind energy, which had faced significant sociopolitical resistance**,** solar projects in Norway had seen less opposition so far. As demand scales, however, land area requirements were projected to increase, potentially leading to opposition as more land is taken up for solar arrays, especially in rural or agricultural areas.

Wind Energy - High Potential with Sociopolitical Challenges

Offshore wind energy had a considerable potential with Norway's coastal regions offering strong consistent wind currents that are ideal for generating power. Offshore wind farms could produce substantial amounts of energy with a relatively stable output with a capacity factor of 51%, complementing the variability of solar. On the other hand, offshore wind projects also presented challenges, requiring substantial investments and cutting-edge technology for both construction and long-term maintenance. Especially the high investment cost, provided offshore wind with a LCOE on 9,86 cent/kWh, significantly higher than solar and onshore wind projects (Exhibit 7). The high costs were largely attributable to the requirements for installing wind turbines at significant distances from the coastline (200–250 km) and at depths requiring specialized infrastructure.

Land wind projects on the other hand, had a relatively low capital requirement compared to offshore wind, with an average investment of 1146 EUR per kWh, compared to offshore which was on average (fixed) 4899 EUR/kWh (Exhibit 6). In fact, according to NVEs calculations (NVE, n.d.) onshore wind delivered the lowest LCOE of all the measured technologies (Exhibit 7). The development of onshore wind projects faced considerable resistance due to environmental and societal concerns. Since the policy changed in 2019, limiting new onshore wind developments, projects had been met with opposition from local communities. Onshore wind turbines could impact landscapes and local ecosystems, especially if sited in natural or recreational areas. While they offered a lower-cost alternative, environmental and aesthetic concerns may slow the permitting process, especially in Norway's protected natural areas**.** Skagerak would need to ensure that the environmental costs are carefully weighed against the long-term sustainability of onshore wind projects. As a result, Skagerak Energi had to carefully evaluate the feasibility and community acceptance of wind projects as it considers this option for expansion.

Nuclear Energy: High Efficiency with Complex Challenges

Nuclear energy was also on the table during the discussion. Nuclear energy was frequently considered a reliable solution for large-scale, stable energy production, offering a continuous power supply with a capacity factor of 89% (Exhibit 6) (NVE, n.d.), while emitting minimal CO_2. For Skagerak Energi, nuclear energy could represent a long-term opportunity to diversify its energy mix and support Norway's low-carbon ambitions. However, the adoption of nuclear energy faced significant challenges in the Norwegian context, particularly regarding its timeline, costs, and social acceptance. Norway had historically been slow to embrace nuclear energy, largely due to its rich hydropower landscape, which accounts for nearly all its electricity generation. In contrast, countries like Poland**,** Canada, and Finland were actively advancing Small Modular Reactor (SMR) technologies as part of their energy strategies.

Poland, starting without prior nuclear infrastructure, were targeting SMR deployment by 2030 to improve energy security and transition away from coal.

For Norway, the timeline for SMR adoption remained uncertain. Global SMR projects, such as those in Canada and the US, were unlikely to become operational before 2030–2035, and Norway's lack of nuclear infrastructure and regulatory frameworks further complicated the situation. These delays underscored that Norway were adopting a more cautious approach than other nations that actively invested in SMR technologies to address their energy security and decarbonization challenges (NEA 2022).

The costs associated with developing nuclear energy in a country that had no existing nuclear infrastructure were considerable, and the regulatory hurdles were significant. The average investment cost of 9.02B EUR serves to underscore the scope of a project of this nature. Despite the high CAPEX, a nuclear SMR project had the potential to replace approximately 540 wind turbines (Exhibit 13). Nevertheless, political resistance remained a significant obstacle, with strong environmental and public opposition due to concerns about safety, waste disposal, and the long-term environmental risks of nuclear power.

Comparison of the different technologies

The board of directors faced challenges in comparing various energy technology investments due to their diverse scopes. To facilitate decision-making, the department presented four projects, each representing a different technology.

ts	LCEO (Cent/kWh)	Investment amount per KW	CAPEX	Yearly production (GW)	Construction time
Off-shore wind (fixed)	9,9	€ 4 899	€ 7 348 627 800	6 701,4	3
On-shore wind	3,6	€ 1 161	€ 116 059 440	350,4	1
Ground-mounted Solar	5,6	€ 565	€ 3 446 783	5,9	0,5
Nuclear Energy	13,6	€ 10 013	€ 9 011 663 640	7 016,8	10

Table 1- project scope and investment cost

Onshore wind, while generally subject to lower financial barriers, encountered regulatory and societal challenges that could affect profitability. The CFO expressed his concerns regarding the high investment costs associated with offshore wind and nuclear energy projects. These ventures would require substantial government support and strategic partnerships with other players to be financially viable. The extended duration of the construction period increased the risk of price volatility, making the project more vulnerable to cost overruns. For offshore wind energy, the scale and technological complexity made partnerships essential. By forming a partnership with companies like Equinor, a company renowned for its extensive offshore expertise and background in fossil fuels, Skagerak could significantly reduce infrastructure costs and mitigate risks associated with project development. However, the reputational risk of partnering with oil companies remains a concern for the department.

In conclusion, the finance department, along with the board, recognized the necessity of expanding the energy portfolio through new technologies, underscoring that profitability, though crucial, is just one aspect of many in a complex market. The question of whether to prioritize solar energy, wind energy (onshore or offshore), or even explore nuclear power reflects the broader need to mitigate the trade-offs between environmental, social, and financial considerations. Ultimately, the board's decision will determine Skagerak Energi's strategic direction and its role in supporting Norway’s and EU’s renewable energy goals. By evaluating each option's opportunities and obstacles, Skagerak can identify the most viable pathway for growth while maintaining its commitment to sustainability and social acceptance.

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CONSULTING REPORT

HOW CAN SKAGERAK ENERGI BUILD SOCIAL ACCEPTANCE FOR ITS RENEWABLE ENERGY PROJECTS IN NORWAY?

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AFTER THE BOARD MEETING 2022

In 2022, Skagerak Energi's board identified solar energy and onshore wind energy as the most viable options for near-term growth. Offshore wind was excluded due to its high investment requirements and advanced technology needs, which were considered beyond the capacity of a regional company like Skagerak. Nuclear energy was ruled out early for near-term investment, largely due to its scale, Norway's regulatory restrictions and uncertainty regarding the technology's future in the country.

The "selected" technologies did not come without challenge: public resistance to wind turbines remained strong, partly due to earlier projects perceived as poorly executed. Solar energy, while associated with profitability challenges, was considered the most feasible alternative for Skagerak at the time. In 2022, the company, in collaboration with Greenstat (Energy Company), applied for a concession to build the "Engene Solar" plant in Southeast Norway.

1. INTRODUCTION

Through our research, we aimed to identify the primary challenges faced by Norwegian companies in developing new renewable energy projects. 16 experts were interviewed to understand the most pressing issues, where the majority (12) identified social acceptance as the main challenge. Similarly, Skagerak Energi interviewees emphasized social acceptance as a major barrier to accelerating renewable energy production. In light of these findings, we concentrated our analysis on this critical issue. Furthermore, other key challenges highlighted by industry experts include profitability and regulatory hurdles, which also have a significant impact on the viability of renewable energy projects. As a result of this initial mapping of the main challenges, the research question has been formulated as follows:

"How can Skagerak Energi build social acceptance for its renewable energy projects in Norway?"

2. SOCIAL ACCEPTANCE

Social acceptance plays a crucial role in the successful transition to renewable energy systems. In renewable energy development, social acceptance refers to the positive support or approval of a project or technology by key groups, including the public, local communities, policymakers, and industry stakeholders. This concept encompasses three key facets: socio-political acceptance, community acceptance, and market acceptance (Wüstenhagen, Wolsink, and Bürer 2007).

Socio-political acceptance refers to the support for renewable energy technologies and policies at a societal level, involving the perspectives of governments, policymakers, and key stakeholders. This dimension often reflects public attitudes shaped by national energy policies, media narratives, and advocacy by influential organizations. Community acceptance, on the other hand, refers to how local communities respond to renewable energy projects, particularly concerning decisions about project locations and perceptions of fairness. Trust between developers and communities is a vital factor in building acceptance, especially in areas where local stakeholders are directly affected by the energy infrastructure. Finally, market acceptance focuses on the adoption of renewable energy technologies by consumers, businesses, and intermediaries such as financiers and suppliers. Without strong market acceptance, even the most politically or locally supported projects may struggle to achieve widespread implementation. (Wüstenhagen, Wolsink, and Bürer 2007).

(Cousse 2021) refers to (Wolsink 2018) and (Upham, Oltra, and Boso 2015) which underlines that the three levels are interconnected and involve a range of actors, including project developers, policymakers, and consumers, each engaging at different levels. For instance, difficulties in achieving community acceptance can negatively affect existing high levels of socio-political acceptance. This demonstrates that the concept of social acceptance is both highly complex and subject to change. Kluskens et al. (2024) argue that acceptance often involves weighing the perceived benefits, such as energy security, reduced emissions, and economic development, against perceived barriers, including visual and environmental impacts or unfairness in benefit distribution (Kluskens, Alkemade, and Höffken 2024). These responses can evolve as projects progress through different phases of development, from planning to operation.

3. METHODOLOGY

3.1 Data Collection

This research is based on a variety of sources to provide the final recommendations. 16 qualitative interviews were conducted with industry experts, and an online survey was distributed to a broader sample of Norwegian respondents (n=308). Extensive online research was also conducted to gather further insights and data.

To address key challenges affecting social acceptance of renewable energy projects, both Skagerak Energi employees and external experts were interviewed. Participants were selected using an informal "snowball sampling" method. Goodman (1961) describes snowball sampling as a technique where each participant in an initial sample identifies one or more additional individuals, who then refer others. While the core principles of snowball sampling were followed, the approach was informal and did not adhere strictly to formal methodological protocols (Atkinson 2001a).

For the quantitative research, an online survey was conducted among Norwegian citizens above 15 years old. The survey was distributed via a shared link. Adhering to the minimum age limit of 15 years is standard practice in research, as this is the age at which individuals are legally able to provide consent for participation (Slagsvold 2023). Data collection period was between 11th -20th November 2024. To ensure robustness and allow for comparative analysis across demographic groups, a target of 300 survey respondents was established. This enabled us to explore differences between groups. A T-test was conducted at the 95% confidence level to determine whether the observed differences were statistically significant.

3.2 Limitations

While this research was designed to ensure robustness, it is important to acknowledge certain limitations. The energy market is a complex landscape, which is bound to be simplified throughout the assignment. While efforts were made to maintain accuracy and factual correctness, these simplifications may not fully capture the market's inherent nuances and complexities.

3.2.1 Data Collection

The representativeness of the Norwegian population in the survey sample may be limited due to the distribution method. The survey was shared via a public link among a limited network of researchers and their contacts, resulting in potential sampling bias. Given the nature of the distribution method employed and its limited reach, the dataset was not weighted for factors such as gender, age, income, or education. This may affect the ability to generalize the findings. Nonetheless, demographic data is transparently presented in (Exhibit 16-22), highlighting key sample attributes.

For the expert interviews, while the snowball sampling method used for qualitative interviews is a common and effective approach, it has inherent limitations. Atkinson (2001) highlights the selection bias as the primary concern of this method, as the process relies on non-objective selection of respondents. To address potential bias from an overrepresentation of Skagerak employees, efforts were made to include a diverse range of interviewees. To ensure multiple perspectives were considered, interviews were also conducted with organizations opposing new renewable energy production.

3.2.2 Recommendations

While the recommendations provided are rooted in extensive research, including findings from interviews, surveys, and benchmark studies, it is important to acknowledge their inherent subjectivity. These suggestions reflect the researchers' interpretations and judgments based on the data collected. Although every effort has been made to ensure the validity and accuracy of the recommendations, they may not fully account for future uncertainties. Additionally, these recommendations are designed as a starting point and should be adapted and refined through ongoing dialogue and feedback from stakeholders during implementation.

4. DATA ANALYSIS AND FINDINGS

Through expert interviews, surveys, and data gathering, several key findings were identified providing valuable insights to the challenges hindering social acceptance of renewable energy projects in Norway.

4.1 Lack of knowledge

A significant challenge identified through both expert interviews and survey data is the lack of public knowledge about renewable energy technologies, energy needs, and their societal benefits. This knowledge gap emerged as a major obstacle to fostering social acceptance for renewable energy projects.

4.1.1 Expert Perspectives

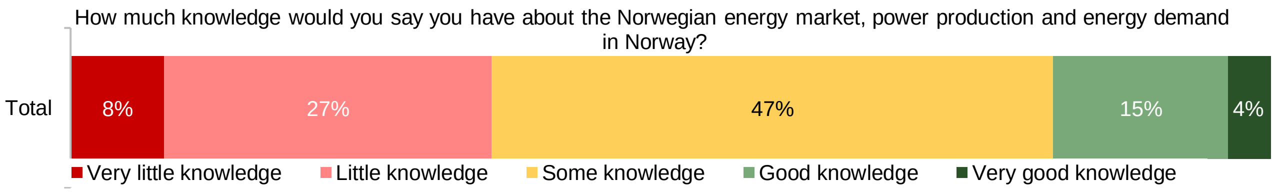
13 out of 16 experts emphasized the critical role of public knowledge and awareness in shaping perceptions of renewable energy (Exhibit 32). Highlighting that the public in general, and many stakeholders have limited understanding of renewable energy’s importance addressing key issues such as energy security, economic development, and climate change. This lack of understanding often results in misconceptions about projects, fueling skepticism and resistance.

Experts also noted the highly polarized nature of the debate surrounding renewable energy in Norway. Anti-renewable energy organizations have gained considerable influence, leveraging large follower bases and widespread campaigns to amplify opposition. This has further intensified skepticism, making it challenging to foster balanced and informed public discourse. Many experts expressed concerns that the public is often unaware of Norway's critical energy needs, including potential power deficits in the near future. Experts stressed the importance of shifting the public focus towards the long-term benefits of renewable energy, such as economic opportunities, environmental sustainability, and contributions to Norway's green transition.

4.1.2 Survey Insights

Survey results reinforce the findings from the interviews, highlighting a significant gap between public interest and knowledge about the renewable energy industry. While 7 out of 10 respondents reported that they read or discuss renewable energy topics at least monthly (Exhibit 23), only 19% stated that they had good or very good knowledge of the Norwegian renewable energy market (Exhibit 24).

Table 2 - Knowledge about Renewable Energy Market in Norway



The survey also revealed significant disparities in knowledge and engagement across demographic groups. Firstly, men report substantially higher levels of both engagement and knowledge compared to women: 35% of men stated they have a good or very good knowledge of the energy market, compared to only 9% of women. Additionally, nearly half of men (49%) discuss renewable energy topics weekly, while only 27% of women report the same level of engagement (Exhibit 23). Secondly, older generations (55+) reveal higher levels of both knowledge and engagement with renewable energy topics compared to younger groups

(Exhibit 24). Lastly, Respondents with higher levels of education and income consistently reported greater knowledge about the Norwegian renewable energy market.

4.2 Not profitable projects

Making renewable energy projects economically viable remains challenging, as highlighted in both expert interviews and survey findings. High costs related to land acquisition and infrastructure development pose significant hurdles. Experts emphasized that profitability is often undermined by substantial upfront investments combined with lengthy concession processes and regulatory requirements, which delay projects and increase financial risk. Ensuring local economic benefits emerged as a crucial factor for fostering social acceptance. In our interviews, "profit sharing with the community" was specifically mentioned by 12 out of 16 participants as a key element in gaining public support (Exhibit 33). Participants emphasized the need for transparent plans clearly outlining how local communities would benefit from renewable energy projects.

4.3 Ranking of Energy Technologies:

The survey asked respondents to rank five energy production technologies based on their preferences for future energy supply. Overall, hydro power and offshore wind emerged as the top-ranked technologies, while onshore wind and fossil fuels consistently ranked at the bottom across all demographic groups (Exhibit 27).

4.3.1 Most positive perception of solar energy

Solar energy emerged as a technology with a notably higher positive perception compared to onshore wind. In general, Norwegians expressed a net positive perception of solar energy, contrasting with a net negative perception of onshore wind. This difference is highlighted in the average scores, with solar energy achieving a positive score of 0.61 and onshore wind receiving a negative score of -0.28. Women showed a slightly more positive perception of solar energy compared to men. For onshore wind, men had a significantly more negative perception compared to women.

Table 3 - Average Perception of Solar and Onshore Wind

	Total	Women	Men
Perception solar	**0,61**	0,56	0,63
Perception Onshore wind	**-0,28**	-0,56	-0,13

* The avg. score is from a scale from -3 to 3 where -3= very negative and 3 = very positive. Max score is therefore 3 and minimum score is -3.

4.4 The need for energy

Respondents were asked to evaluate a series of statements regarding renewable energy production. A significant majority (89%) of respondents agreed with the statement that Norway should increase renewable energy production in the near future (Exhibit 31).

4.5 Lack of public trust

A significant challenge identified is the divided public perception of trust in renewable energy companies. One third of the respondents do not trust energy companies to act sustainably in relation to local communities (Exhibit 31). The survey also underscores the influential role of local politicians in shaping public support for renewable energy projects. 57% of respondents indicated that they would be more inclined to support renewable energy developments if policymakers publicly endorsed these projects. Broader research further substantiates the lack of trust in the energy sector. In 2021, the sector ranked among the lowest in terms of trust and reputation (Espedal 2021). This aligns with findings from interviews, where Skagerak employees identified establishing credibility as one of their primary challenges in communication efforts. Together, these insights highlight the pervasive trust deficit as a barrier to advancing renewable energy initiatives and achieving broader public acceptance.

4.6 Main findings

Based on the analysis, three main challenges that deter social acceptance of renewable energy projects have been identified. These challenges form the foundation for our recommendations. (1) Lack of public knowledge and awareness**.** There is a significant gap in the public's understanding of renewable energy, its necessity, and the potential benefits it brings. This lack of awareness often leads to misconceptions, skepticism, and resistance towards renewable energy initiatives, particularly in local communities where new projects are proposed. (2) Lack of public trust in renewable energy companies. There exists a substantial trust deficit between renewable energy companies and the public. This distrust is often fueled by perceptions of profit-driven motives and insufficient engagement with local communities, further complicating efforts to gain social acceptance for new projects. (3) Profitability challenges**.** Regulatory complexities, lengthy and unpredictable concession processes, and uncertain financial returns are some of the primary factors that make it difficult for projects to achieve financial viability. It is prudent for Skagerak to show how their projects can foster economic growth in the region to gain sociopolitical acceptance.

5.RECOMMENDATIONS

To ensure the successful implementation of renewable energy projects while fostering social acceptance, we propose a set of targeted recommendations for Skagerak Energi, build on our findings from surveys, interviews, and industry analysis. The main recommendations are (1) gain trust by involving the local community in the early stages, (2) raise public awareness through partnerships, (3) ensure and demonstrate economic benefits for the local community and (4).

5.1 – Gain trust by involving the local community in early stages

The renewable energy sector faces significant challenges related to public trust, as highlighted in the findings. One-third of respondents (Exhibit 31) do not trust renewable energy companies to make sustainable decisions for their local area. The widespread perception that renewable energy firms are primarily profit-driven creates a significant barrier to fostering community trust. Research highlights the importance of early engagement in building trust and aligning renewable energy projects with community values and expectations (Cousse 2021).

5.1.1 Leveraging Political Support

A majority of respondents (57%) indicated that they would be more supportive of renewable energy projects if endorsed by local politicians. This highlights the potential for politicians to act as trusted intermediaries, communicating project benefits and addressing public concerns (Segreto et al., 2020). The recommendation is to engage local politicians early in the planning process through information sessions and consultation meetings. By actively involving politicians Skagerak can present their vision for the project, address misconceptions, and incorporate feedback from politicians in the relevant municipality into the project planning process. This recommendation aligns with the European model of participatory democracy, which emphasizes active citizen involvement in decision-making processes, particularly in areas like renewable energy projects. The early inclusion of politicians can help mitigate potential conflicts and contribute to building long-term community support (Wahlund and Palm 2022).

5.1.2 Prioritizing Acceptable Sites

Prioritizing project locations with slightly lower energy potential but more likely to be accepted by the local community, could prove to be a sustainable strategy. A recent example of community resistance illustrates this point: a proposed solar power plant in Larvik (municipality), faced significant opposition due to its location in a heavily used recreational area. Although measures were proposed to mitigate concerns, such as planting vegetation along hiking trails to preserve recreational value and reduce panel visibility (Østlands-Posten, 2024), starting a project in an area already opposed by the public presents significant challenges. An example of successful engagement is Skagerak's first and so far, only ground mounted solar power plant is the project called Engene Solar Power Plant**.** Skagerak actively involved the local community early in the process, collaborating with residents and local organizations to ensure the project aligned with community interests. This approach helped secure broad public acceptance and allowed project adjustments that minimized local concerns.

5.1.3 Timeline for Implementation

Structured activities, such as public forums, information sessions, and consultation meetings, are effective tools for fostering acceptance. These platforms enable open communication, address misconceptions, and integrate community concerns into project planning. This participatory approach aligns with the principles of procedural justice as outlined in the European model of participatory democracy (Segreto et al., 2020).

Table 4 - Action Point Gaining Trust

	Action	Description
Short term (6-12 months):	Understand local priorities	Carry out a regional population survey focusing on potential development areas Focus groups with a mix of politicians, industry leaders and residents to understand the priorities and perspectives of different stakeholders.
Medium-Term (1-3 years):	Share numbers and values with municipalities and government bodies	Launch an online dashboard to provide regular updates on project progress and invite local municipalities to have access to key features. Power BI has a free version for Microsoft users.
	Introduce project concepts and gather initial feedback	Hosts afternoon seminar meetings preferably in collaboration with the local municipality where potential projects are discussed. Limited seats in person with free entrance + streaming with unlimited seats.
Long-Term (3+ years):	Ensure project Transparency	Publish key numbers for the public when a project is confirmed to be pursued.
	Institutionalize participatory frameworks	Ensure that community engagement becomes a standard practice for future projects.
	Consistent data gathering	Ensure consistent data collection through population surveys – quarterly or yearly to have an overview of developments over time.

Failure to adopt inclusive practices can lead to community resistance. Lack of transparency and involvement fosters distrust, which can delay or block projects entirely. By prioritizing early and meaningful stakeholder engagement, developers can mitigate conflicts, establish trust, and secure long-term community support for renewable energy projects.

5.2 - Raise public awareness through partnership

The expert interviews and survey data highlighted a shared understanding of a significant knowledge gap in the population. Only 19% of respondents claim to have a good understanding of the Norwegian energy market, including power production and energy demand (Exhibit 24). Additionally, 13 out of 16 experts identified knowledge as a major barrier to social acceptance (Exhibit 33). A strong consensus emerged that increasing public awareness about energy demand, renewable energy markets, and the societal benefits of energy production is essential for improving community acceptance. Experts emphasized that renewable energy firms alone may lack the credibility needed to educate the public effectively, as they are often perceived as profit driven.

5.2.1 Targeted communication

The survey reveals that the general population is regularly exposed to a significant amount of information about the energy market, with 70% of respondents reading, discussing, or hearing about renewable energy topics at least once a month (Exhibit 23). This underscores the importance of a well-defined communication strategy with clear targets and tailored messaging. Notably, the consumption of information and knowledge about renewable energy is significantly lower among women than men, with 9% of women claiming to have good knowledge compared to 35% of men (Exhibit 24). There is a potential to increase the overall perception by increasing the knowledge of the female population. Focusing communication efforts on platforms frequented by women could be effective to reach this group. When organizing seminars, we recommend making sure of close to equal gender representation. Reaching a wider audience of women may be necessary to achieve balanced representation, but this effort is essential to effectively bridge the knowledge gap.

5.2.2 Establish Strategic Partnerships to Address the Knowledge Gap

To address this knowledge gap, we recommend forming strategic partnerships with key stakeholders such as industrial actors, environmental organizations, labor unions, and policymakers. These partnerships can collaboratively develop public education campaigns and create a unified narrative about the energy transition. Industrial actors, for instance, can highlight the critical need for energy to sustain production and economic stability, adding credibility and demonstrating the societal importance of renewable energy beyond corporate interests. One of Skagerak Energi's core strategic pillars is to be a "safe partner", ensuring safety in operations and deliveries, fostering organizational and workforce development, and demonstrating accountability at all levels (Skagerak Energi 2023). As a locally trusted company with the backing of a stable parent company, we recommend that Skagerak capitalize on this strategic advantage by emphasizing its role as a stable and trusted collaborator.

5.2.3 Define Roles and Responsibilities

A significant issue arises from the lack of knowledge: namely, the question of responsibility for public education. The obligation should not be a solo effort, but rather a coalition of stakeholders working towards a common goal, increasing public knowledge of future energy needs. Skagerak, as a regional market leader, could spearhead the initiative.

Another challenge identified in interviews is the fragmented landscape of public communication and the polarized debate surrounding renewable energy. Some experts mentioned industrial actors, which are significant consumers of energy, often refrain from participating in public debates, despite their reliance on stable and renewable energy supplies. This can lead to a fragmented debate with energy producers on one side and opposition towards renewable energy projects on the other. While energy producers like Skagerak Energi are at the forefront of renewable energy production, they often face public skepticism, limiting their effectiveness in leading the discussion. This leaves a gap in communication, where energy producers are perceived as profit-driven while opposition narratives gain traction. This emphasizes the necessity for a joint initiative between stakeholders from various sectors to educate the public about the increasing demand for energy and the advantages of renewable energy projects.

Table 5 - Key Roles in Partnership to Raise Awareness

Key roles in a collaborative partnership include:	
Skagerak Energi	Providing technical expertise and transparency about project impacts.
Industrial Actors (e.g., Yara):	Advocating renewable energy is essential for maintaining competitiveness and meeting increasing energy demands.
Environmental Organizations (e.g., ZERO):	Mediating public concerns and emphasizing the societal and environmental benefits of renewable energy.
Labour Unions (e.g., LO, Fellesforbundet):	Highlighting job creation and economic opportunities tied to renewable energy projects.
Policymakers:	Integrating perspectives into actionable policies to address public needs and foster local development.

5.2.4 Framework for Governance

Establishing a formal partnership governance framework would further strengthen these collaborations. A McKinsey survey found that 47% of executives consider aligned goals critical to the success of a partnership (De Backer and Rinaudo 2019). The framework should include (1) aligned objectives and shared responsibilities, (2) clear metrics and KPIs for tracking progress, (3) unified messaging for public outreach and engagement, and (4) transparent communication protocols to address public concerns and foster trust.

5.2.5 Timeline for Implementation

By fostering partnerships with major industrial players and demonstrating the mutual benefits of renewable energy production, Skagerak Energi shows initiative to educate the public and increase the likelihood of securing approvals for future renewable energy projects. These partnerships represent a strategic pathway to align industrial and societal goals, ensuring long-term regional growth and energy sustainability in the region.

Table 6 - Action Points - Raising Awareness

	Action	Description
Short term (6-12 months):	Form an Interim Coalition	Identify key stakeholders (e.g., industrial actors, environmental organizations, policymakers, labor unions) and convene an initial working group to align on shared objectives. Use this coalition to explore public education campaign ideas and outline preliminary roles.
Medium-Term (1-3 years):	Community Outreach	Organize town hall meetings co-hosted with coalition partners to provide a forum for Q&A sessions. Based on findings, indicating lower levels of knowledge about renewable energy among women and young age groups. These town halls should particularly focus on engaging these groups. It is crucial to create a space for diverse voices.
	Media dialog	Keep a dialog with local media to prevent misinformation from being published.
	Track Engagement Metrics	Use analytics from the website, and attendance at public forums to evaluate progress and refine campaigns as needed.
Long-Term (3+ years):	Consolidate Public Trust	Use coalition's tools to foster consistent communication about renewable energy projects, demonstrating accountability and benefits through data sharing and public success stories.
	Institutionalize participatory frameworks	Community engagement as a standard practice for future projects.
	Consistent data gathering	Ensure consistent data collection through population surveys – quarterly or yearly to have an overview of developments over time.

5.3 Ensure and Demonstrate Economic Benefits for the Local Community

Expert interviews reveal that economic benefits for the local community play a crucial role in the acceptance of renewable energy projects. It is therefore evident that projects which generate economic benefits are of great importance, especially market- and sociopolitical acceptance. Informing municipalities about these economic impacts can empower them to effectively communicate the benefits to the local public, fostering also community acceptance. The mayor of Larvik, an important municipality for Skagerak with potential for solar and wind projects, emphasized the need for robust, data-backed evidence. Without a solid foundation of facts, raising the topic could be politically risky, or as the mayor put it, parallel to "political suicide" because of the lack of acceptance.

To exploit market acceptance, Skagerak Energi must focus on creating a value co-creation model that highlights mutual benefits for both the company and stakeholders. While municipalities can assist Skagerak by facilitating land acquisition and securing concessions for renewable energy projects, Skagerak must effectively demonstrate how and to what extend increased energy production will benefit the region.

5.3.1 – Conducting an economic impact analysis

Conducting an economic impact analysis (Exhibit 35) would be an effective method of demonstrating direct and ripple effects of projects. As an example, KPMG has developed an economic impact analysis of both solar energy (KPMG Ireland 2024) and onshore wind (KPMG 2021) in Ireland, highlighting social, economic and environmental benefits. To extend the analysis even further, Skagerak can partner up with local industry and analysis ripple effects of providing local industry with more green energy. By providing clear, evidence-backed communication, Skagerak can strengthen its case for concessions and acceptance, enhancing its competitive edge in securing project areas over direct and indirect competitors.

An economic impact analysis can investigate three different levels of economic effects. International Finance Corporation (IFC, n.d.)presents a framework including direct economic effects, indirect effects and induced effects. We suggest adding long-term dynamic effects that quantify the effects of people moving to the region as a result of a solar or wind project.

5.3.2 Timeline for Implementation

Table 7 - Action points, Ensure Economic Benefits for Local Community

	Action	Description
Short term (6-12 months):	Reach out to municipalities, industry stakeholders and parent company	Stakeholders like Statkraft might be interested in co-financing project.
	Form a team for economic impact analysis	Internal analyst team or plan for a bidding process for external consultants. Limited budget: Engage with a university that has economics students and collaborate on a thesis research project.
	Define which project to measure	Existing or a future project.
Medium-Term (1-3 years):	Developing economic impact analysis	Data collection and analysis.
	Present the final report	It is crucial to reach a broad audience and tailor the presentation to their specific needs.

Long-Term (3+ years):	Ensure consistency in measuring	Economic impact analysis every second year: KPIs, studying development over time. The consecutive reports will leverage from synergies using the same model as the first report and will therefore take less time and resources to perform – less costly.
	Innovation within research	Plan on developing new research methods to deliver high quality economic measures.
	Share results online	Include results in dashboard solutions for KPIs to share with partners and municipalities.

5.4 - Prioritize Solar Energy, Strategize for Wind Energy

5.4.1 Leverage Solar Energy in the Short Term

As highlighted in the findings, solar energy enjoys significantly higher public support compared to onshore wind. The survey results indicate a net positive perception of solar energy, while onshore wind has a net negative (Table 3). Considering the scalability required for substantial energy production, Skagerak Energi should focus on both rooftop installations and grounded solar power plants. While rooftop solar is publicly favored, grounded installations will be necessary to meet Norway's growing energy demands (Exhibit 2). Early and transparent engagement with local communities, combined with tailored education campaigns, can further mitigate resistance and foster acceptance.

5.4.2 Strategically Position for Onshore Wind Energy Long-Term

Onshore wind energy remains debatable due to environmental concerns and negative public perceptions. However, it is a critical component of Norway's renewable energy strategy due to its large-scale production capacity and potential to diversify the country's energy mix as hydropower development reaches its limits. To position onshore wind in the long term, it will be essential to overcome public resistance and integrate wind energy into the broader national energy transition. As technology advances and efficiency improves, onshore wind will become increasingly cost-competitive, making it a key player in Norway's renewable future.

5.4.3 Recommendations for Action

Table 8 - Action Points, Technology Prioritization

	Action	Description
Short term (0-2 years):	Prioritize Solar Energy	Combining rooftop and grounded installations.
	Begin Public Engagement effort for onshore wind	Conduct surveys and host community forums to identify less contentious locations and incorporate public feedback in project planning.
Medium-Term (3-5 years):	Pilot Onshore Wind Project	Implement pilot onshore wind projects in sites with greater public acceptance and use these projects as case studies to demonstrate the feasibility and benefits of onshore wind development.
	Follow trends, technologies and innovation in solar and wind projects.	Attend webinars and seminars to stay informed about the newest technologies and trends both domestically and internationally.
Long-Term (5+ years):	Expand onshore wind project	Based on insights gained from pilot project.
	Normalize wind energy	Highlighting its role in addressing energy shortages and meeting climate goals.
	Increase efficiency solar energy	Continue to work developing efficient solar technology, increasing the profit margin.

Solar energy represents the most viable short-term focus due to its positive public perception and the immediate scalability potential of grounded solar power plants. Onshore wind energy, while facing resistance, remains essential for meeting long-term energy demands. By combining public engagement, strategic site selection, and phased implementation, Skagerak Energi can successfully integrate onshore wind into Norway’s renewable energy mix while maintaining public trust and support.

Accelerating the Green Transition

Skagerak’s strategy to accelerate the green transition reflects the urgent need for action. The 2030 climate goals are within reach but increasingly at risk without a rapid transformation of the energy mix. To meet these targets, Skagerak must play a vital role in building public understanding and acceptance of renewable energy projects. As highlighted in BCG’s report, Outlook for Norway, “Government and industry alike must communicate the urgency to the general public.” (Kristoffersen et al. 2024) Achieving this mission requires collective effort and decisive action. A overall roadmap with summarized action points is provided in Exhibit

37, outlining the measures to be taken in response to the various challenges. The time to act is now and only through sharp communication and collaboration can we ensure a sustainable future and meet the 2030 climate goals.

6. CONCLUSION

The successful implementation of renewable energy projects in Norway depends significantly on achieving social acceptance at community, socio-political, and market levels. This report identifies three primary challenges hindering acceptance: lack of public knowledge, a pervasive trust deficit, and profitability concerns tied to renewable energy projects.

The findings underscore the importance of public engagement, early-stage community involvement, and transparent communication for building trust. Strategic partnerships with stakeholders are important for addressing knowledge gaps and fostering collaborative solutions. Furthermore, conducting comprehensive economic impact analyses can demonstrate the tangible benefits of projects, enhancing both public and governmental support.

Prioritizing solar energy as a short-term focus aligns with public preferences and offers immediate opportunities for scaling energy production. In contrast, onshore wind energy, while essential for long-term energy goals, requires a strategic and phased approach to overcome public resistance and environmental concerns. By adopting these strategies, Skagerak Energi can position itself as a trusted regional leader in Norway's green transition, contributing to sustainable regional growth and energy security.

Future research should explore how evolving technologies and regulatory frameworks impact social acceptance dynamics and investigate long-term strategies for integrating renewable energy into local ecosystems.

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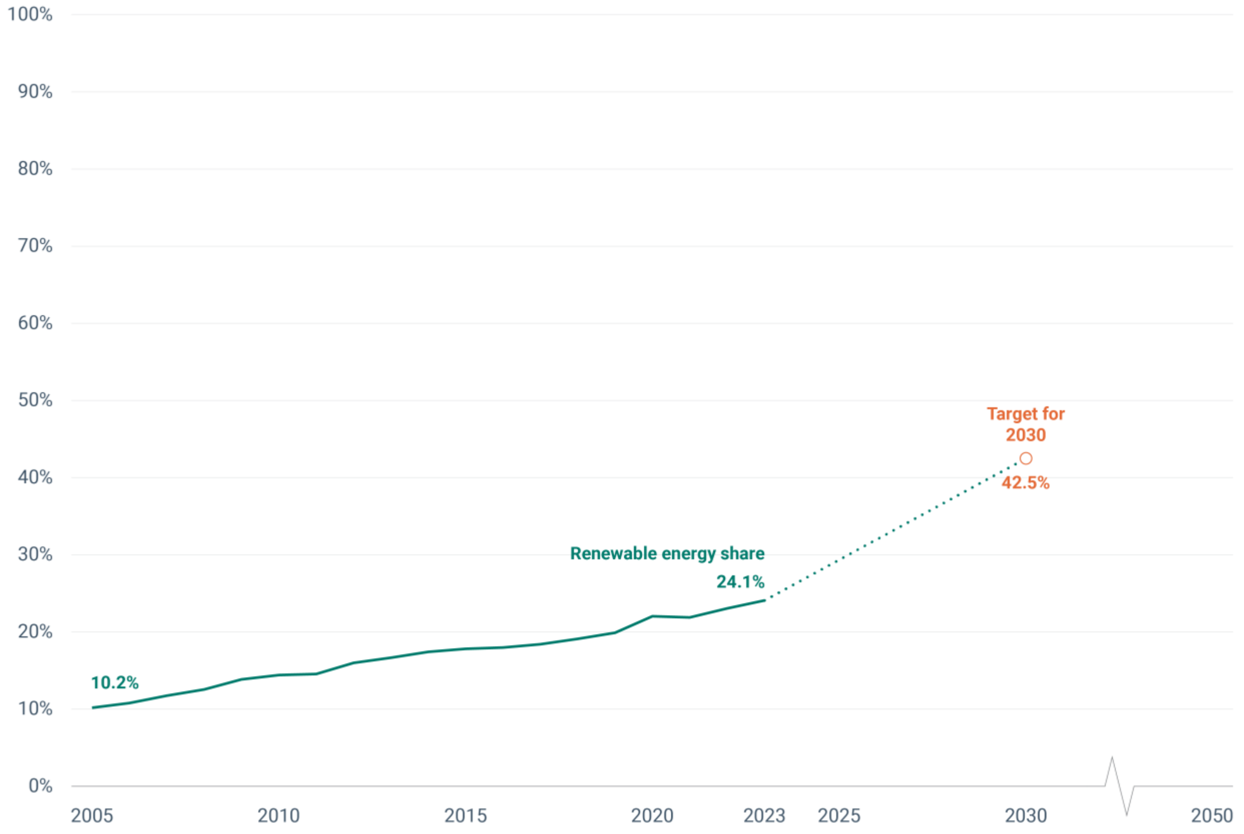
APPENDIX

APPENDIX A – CASE

Exhibit 1 – EU target and progress towards 2030



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https://www.eea.europa.eu/en/analysis/indicators/share-of-energy-consumption-from.

Exhibit 2 – Projected development of production and demand in Norway 2021-2040

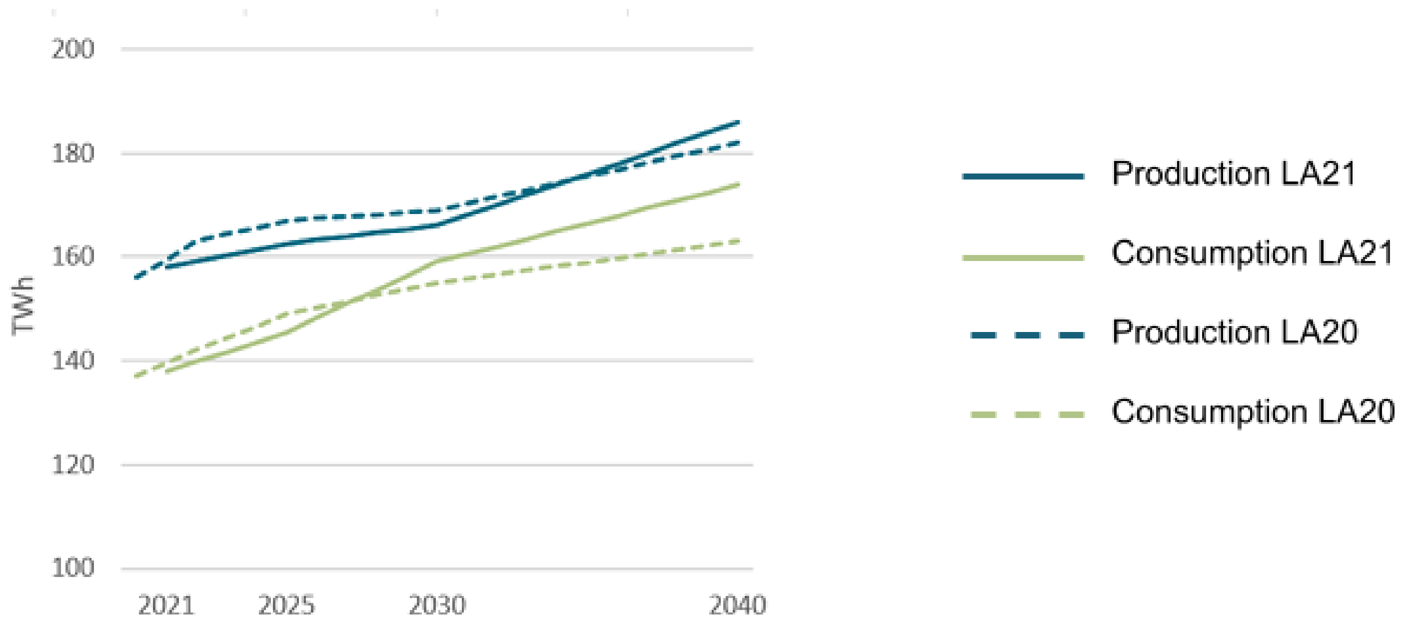

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Exhibit 3 – Organizational Structure

Organizational structure

Skagerak Energi operates through three key subsidiaries that collectively support its renewable energy objectives.

- *Skagerak Kraft AS* is the subsidiary responsible to produce renewable energy, primarily through hydropower.
- *Skagerak Varme AS* focuses on district heating, offering sustainable heating solutions for communities and industries in the region.
- *Lede AS*, however, operates within a different regulatory framework as the manager of the electricity distribution grid. This subsidiary ensures the reliable distribution of energy across the region but operates independently from Skagerak Kraft AS, due to strict regulatory restrictions. Lede AS does not provide Skagerak Kraft with privileged access to the grid; instead, Skagerak Kraft must wait for available capacity on the grid along with other market players, adhering to Norway's regulatory principles that promote equal access.

Exhibit 4 – Organizational map Skagerak Energi

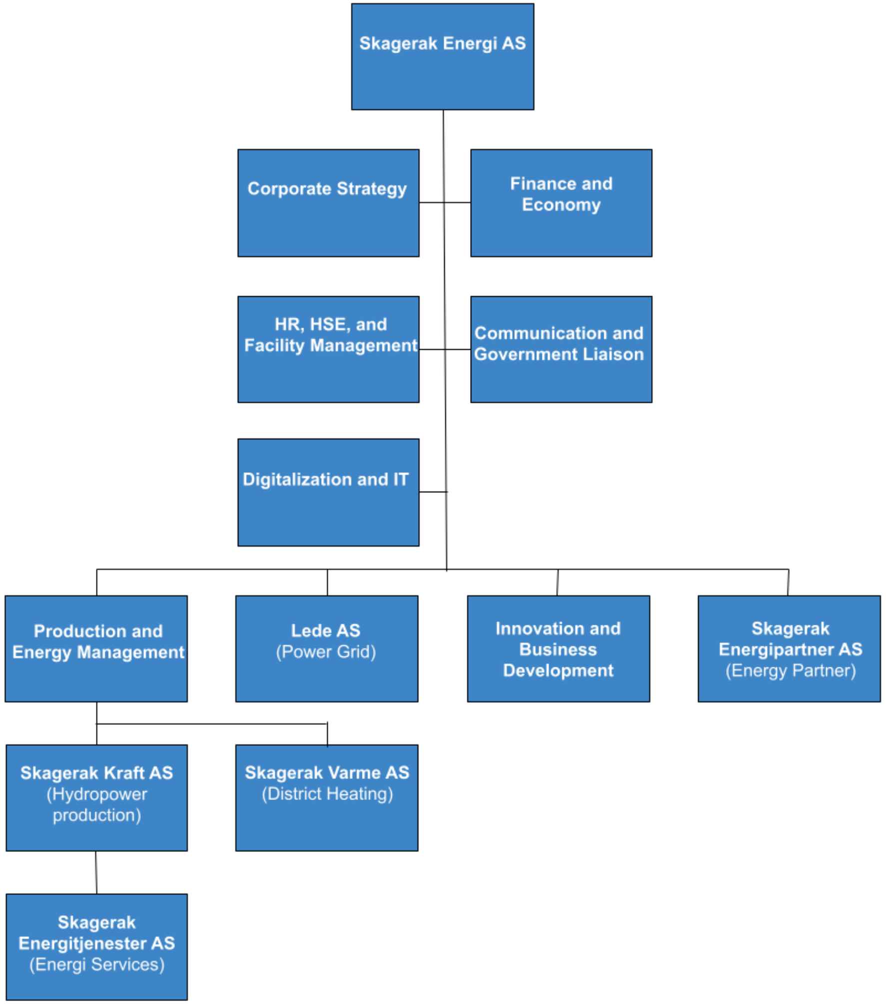

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Exhibit 5 – Key Financial Figures 2014-2021, Skagerak Energi

	Unit	2021	2020	2019	2018	2017	2016	2015	2014
Financial ratios									
Gross operating revenue	M€	€ 565	€ 180	€ 288	€ 294	€ 237	€ 212	€ 204	€ 215
EBITDA	M€	€ 416	€ 77	€ 186	€ 169	€ 140	€ 92	€ 120	€ 100
EBITDA-margin	%	74 %	43 %	64 %	58 %	59 %	43 %	59 %	47 %
EBITDA, underlying	M€	€ 415	€ 76	€ 176	€ 172	€ 140	€ 112	€ 89	€ 99
EBITDA-margin, underlying	%	73 %	42 %	61 %	59 %	59 %	53 %	44 %	46 %
Operating Profit (EBIT)	M€	€ 373	€ 35	€ 143	€ 122	€ 94	€ 48	€ 76	€ 61
Net income	M€	€ 161	€ 46	€ 184	€ 91	€ 45	€ 32	€ 59	€ 13
Operating Margin	%	66 %	20 %	50 %	42 %	40 %	23 %	38 %	28 %
Return on Equity (ROE)	%	20 %	6 %	30 %	19 %	10 %	8 %	17 %	4 %
Underlying Return on Average Capital Employed (ROACE)	%	41 %	3 %	15 %	15 %	12 %	9 %	6 %	8 %
Balance									
Total Assets	M€	€ 1 529	€ 1 225	€ 1 274	€ 1 112	€ 1 074	€ 989	€ 1 019	€ 980
Total Liabilities	M€	€ 662	€ 503	€ 569	€ 588	€ 620	€ 572	€ 626	€ 660
Shareholders' Equity	M€	€ 867	€ 722	€ 705	€ 524	€ 453	€ 417	€ 393	€ 321
Net Interest-Bearing Debt	M€	€ 36	€ 298	€ 306	€ 319	€ 402	€ 408	€ 429	€ 457
Capital Employed	M€	€ 814	€ 1 005	€ 997	€ 817	€ 828	€ 805	€ 802	€ 733
Liquidity									
Cash Reserves	M€	€ 295	€ 38	€ 15	€ 29	€ 23	€ 18	€ 55	€ 26
Cash Flow from Operating Activities	M€	€ 434	€ 18	€ 94	€ 129	€ 79	€ 84	€ 51	€ 51
Total investment	M€	€ 87	€ 86	€ 81	€ 83	€ 73	€ 56	€ 56	€ 69
Number of employees									
Women	#	178	167	166	156	154	159	160	172
Men	#	506	496	470	477	457	451	457	600
Total	#	684	663	636	633	611	610	617	772
Production									
Power Generation	GWh	6 504	6 358	4 947	5 820	5 949	5 993	6 071	6 216
Grid Costumers	#	211 000	209 000	205 545	198 666	194 327	190 496	188 700	186 700
Grid	km	17 902	17 513	16 969	17 100	17 003	16 933	16 772	16 732
Delivered Electrical Energy to End User	GWh	7 264	7 104	7 136	7 485	7 282	7 110	7 008	6 887
Heat Revenue	GWh	155	135	151	141	120	114	88	78
Other									
Purchase of Goods and Services	M€	€ 82	€ 56	€ 62	€ 72	€ 50	€ 52	€ 46	€ 59
Expensed Taxes and Public Charges	M€	€ 220	€ 22	€ 75	€ 85	€ 59	€ 48	€ 38	€ 54
Sick Leave	%	3 %	3 %	3 %	4 %	4 %	3 %	4 %	4 %
Total Number of Injuries per Million Working Hours	#	4,2	0,9	10,5	2,1	2,2	4,2	6,8	5,7

Retrieved from: Skagerak Energi. 2024. “Skagerak - Årsrapport 2023.” (Skagerak – Annual Report 2023)

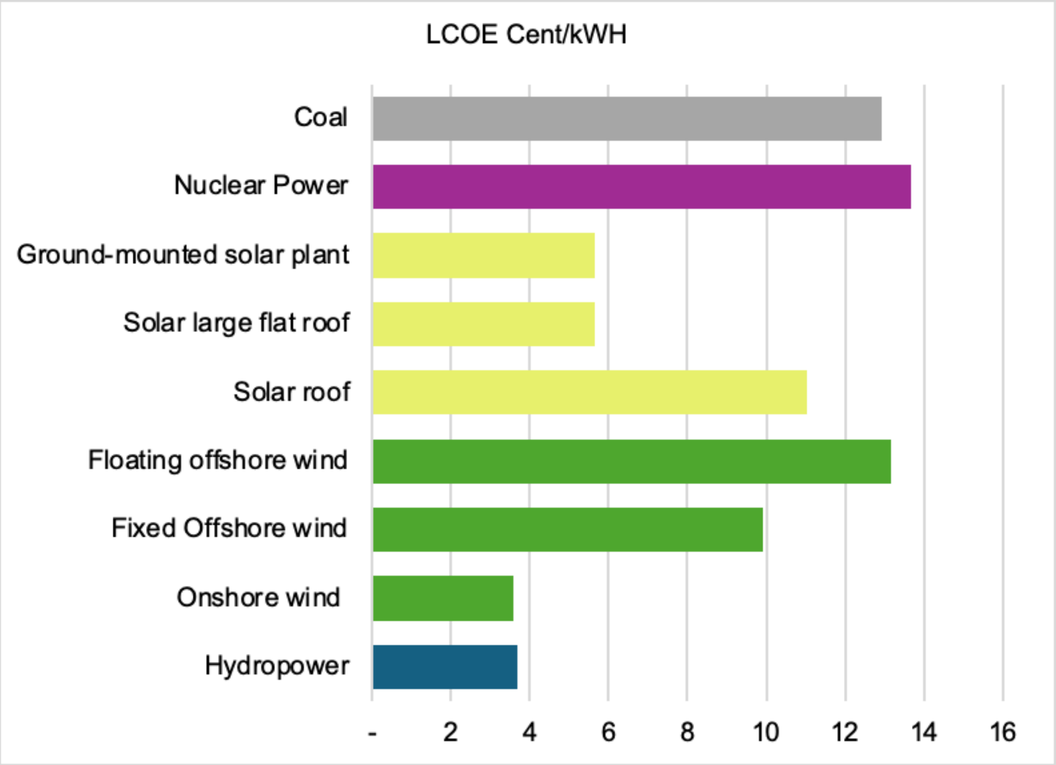
Exhibit 6 – LCOE: Power production cost over lifetime

	Hydropower (>10MW)	Hydropower (<10MW)	Onshore wind	Fixed Offshore wind	Floating offshore wind	Solar roof	Solar large flat roof	Ground-mounted solar plant	Nuclear Power	Coal
Levelized Cost of Energy [EUR/kWh]	€ 0,04	€ 0,04	€ 0,04	€ 0,10	€ 0,13	€ 0,11	€ 0,06	€ 0,06	€ 0,14	€ 0,13
High LCOE [EUR/kWh]	€ 0,05	€ 0,04	€ 0,04	€ 0,12	€ 0,16	€ 0,15	€ 0,07	€ 0,06	€ 0,15	€ 0,18
Low LCOE [EUR/kWh]	€ 0,02	€ 0,03	€ 0,03	€ 0,08	€ 0,10	€ 0,07	€ 0,05	€ 0,05	€ 0,12	€ 0,09
LCOE Operations [EUR/kWh]	€ 0,01	€ 0,01	€ 0,01	€ 0,02	€ 0,03	€ 0,01	€ 0,00	€ 0,01	€ 0,02	€ 0,01
LCOE Fuel [EUR/kWh]	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 10,00	€ 116,00
LCOE Investment [EUR/kWh]	€ 0,03	€ 0,03	€ 0,03	€ 0,08	€ 0,10	€ 0,10	€ 0,05	€ 0,04	€ 0,11	€ 0,02
Value Factor Adjusted LCOE [EUR/kWh]	€ 0,03	€ 0,05	€ 0,04	€ 0,11	€ 0,14	€ 0,15	€ 0,08	€ 0,08	€ 0,13	€ 0,12
Value Factor	1,25	0,77	0,89	0,93	0,93	0,73	0,73	0,73	1,03	1,05
Value Factor Adjustment [EUR/kWh]	-€ 0,01	€ -	€ 0,00	€ 0,00	€ 0,00	€ 0,05	€ 0,03	€ 0,03	-€ 0,00	-€ 0,01
Investment Cost [EUR/kW]	€ 1 567	€ 1 567	€ 1 162	€ 4 905	€ 5 502	€ 1 248	€ 533	€ 566	€ 10 025	€ 2 018
Operating and Maintenance Cost [EUR/kWh]	€ 0,01	€ 0,01	€ 0,01	€ 0,02	€ 0,03	€ 0,01	€ 0,00	€ 0,01	€ 0,02	€ 0,01
Fuel Cost [EUR/kWh]	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 0,00	€ 0,02
Economic Lifetime [Years]	40	40	30	30	30	30	30	30	40	25
Construction Time [Years]	3	2	1	3	3	0	0	0,5	10	4
Degradation Rate [%/year]	0,0 %	0,0 %	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	0,1 %	0,1 %
Discount Rate [%]	6,0 %	6,0 %	6,0 %	6,0 %	6,0 %	6,0 %	6,0 %	6,0 %	6,0 %	6,0 %
Capacity Factor [%]	38,0 %	39,0 %	40,0 %	51,0 %	47,0 %	10,0 %	9,0 %	11,0 %	89,0 %	91,0 %
Projected LCOE (2030) [EUR/kWh]	€ 0,04	€ 0,04	€ 0,03	€ 0,09	€ 0,12	€ 0,10	€ 0,05	€ 0,05	€ 0,14	€ 0,13
Historical LCOE (2023) [EUR/kWh]	€ 0,04	€ 0,03	€ 0,03	€ 0,06	€ 0,10	€ 0,10	€ 0,06	€ 0,05	€ 0,07	€ 0,11
Historical LCOE (2021) [EUR/kWh]	€ 0,03	€ 0,03	€ 0,03	€ 0,06	€ 0,10	€ 0,09	€ 0,06	€ 0,04	€ 0,06	€ 0,06

Retrieved from:

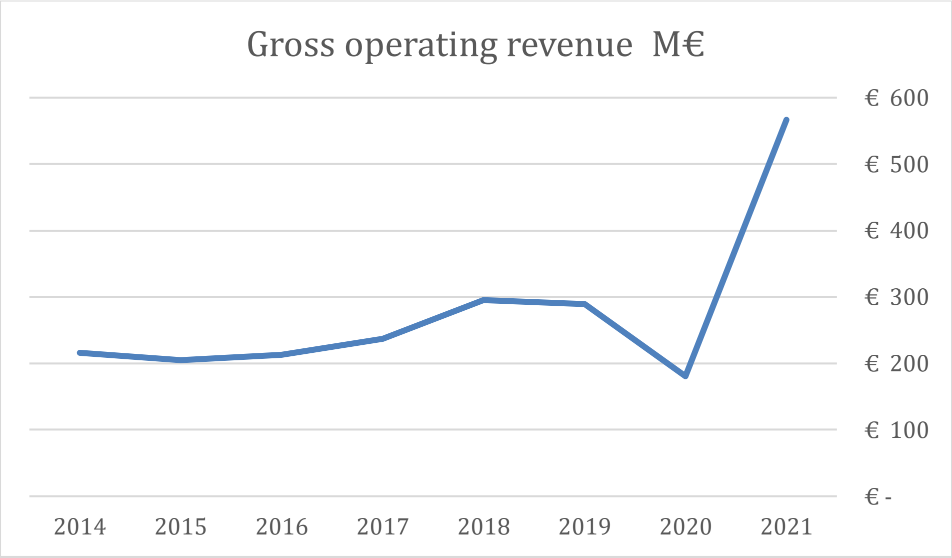
NVE. n.d. "Kostnader for Kraftproduksjon - NVE." www.nve.no. https://www.nve.no/energi/analyser-og-statistikk/kostnader-for-kraftproduksjon/.

Exhibit 7 – LCOE, Levelized Cost of Energy



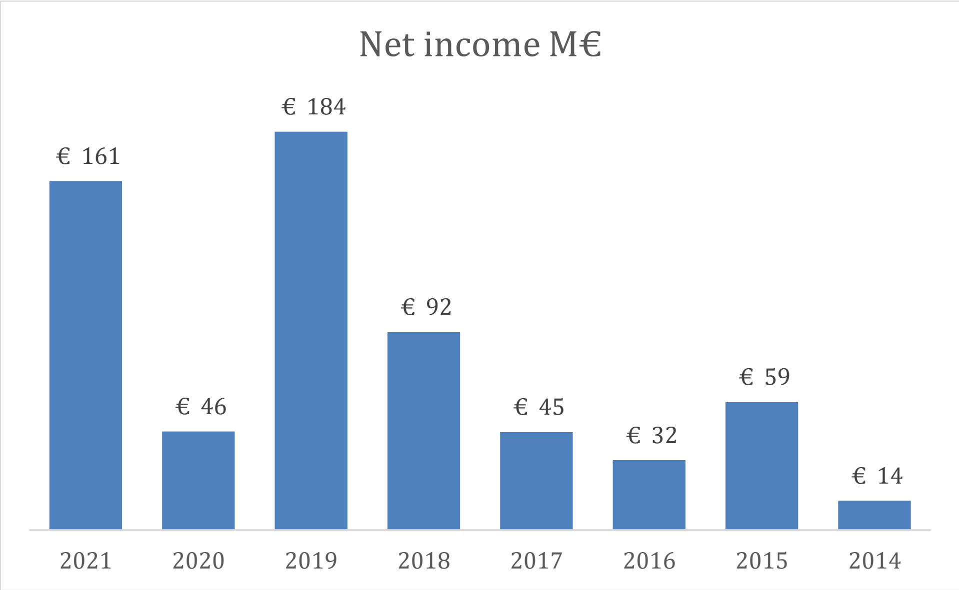
Depicted by:
NVE. n.d. "Kostnader for Kraftproduksjon - NVE" (Costs of Power Production - NVE). Accessed December 13, 2024. https://www.nve.no/energi/analyser-og-statistikk/kostnader-for-kraftproduksjon/

Exhibit 8 - Skagerak Energi, Gross Operating Revenue



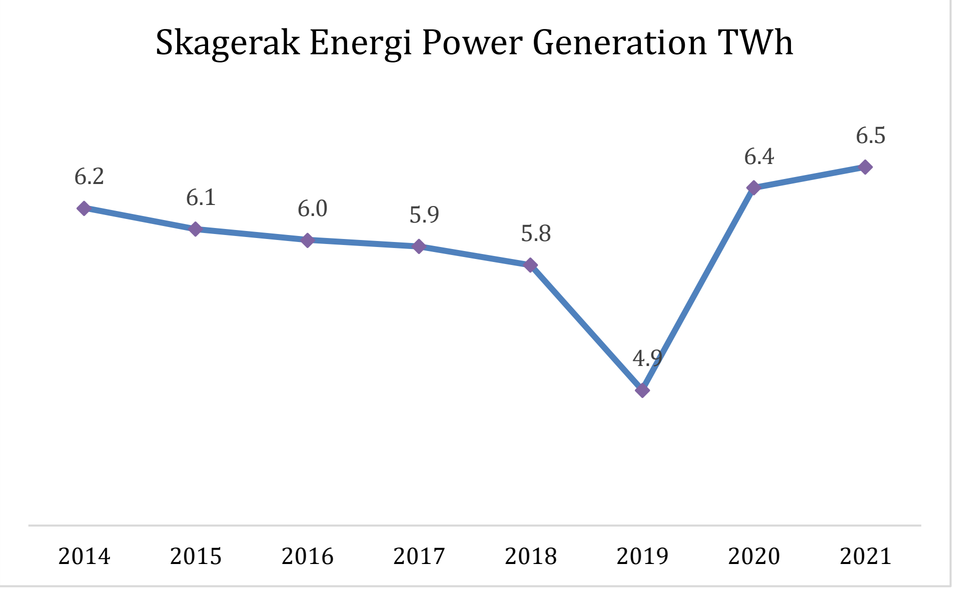
Source: Skagerak annual report 2023

Exhibit 9- Skagerak Energi Net Income



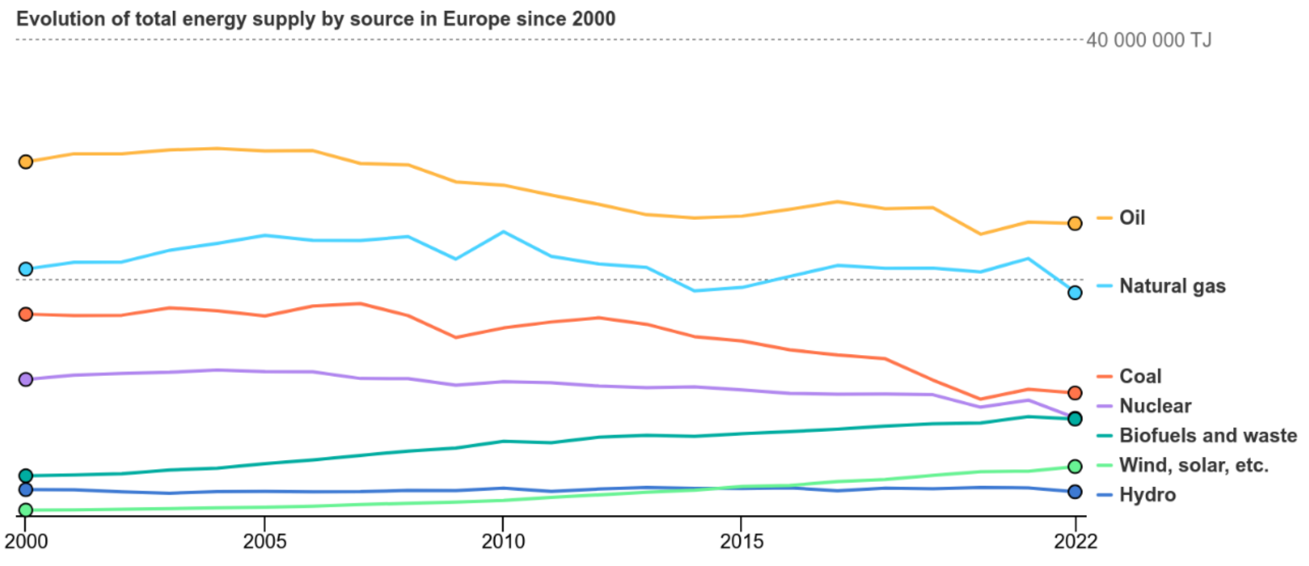
Source Skagerak numbers: Annual report 2023

Exhibit 10 – Skagerak Energi Power Generation



Source Skagerak numbers: Annual report 2023

Exhibit 11 – Evolution of total energy supply in Europe



Source:

IEA, World Energy Statistics and Balances, IEA, Paris https://www.iea.org/data-and-statistics/data-product/world-energy-statistics-and-balances, License: Terms of Use for Non-CC Material

Exhibit 12 – Concession Process Solar Energy in Norway

Source:

Thommesen. 2023. "Konsesjonsprosessen for Solkraft (Concession Process Solar Energy)." Thommesen.no. Thommesen. October 6, 2023. https://www.thommessen.no/aktuelt/konsesjonsprosess-solkraft.

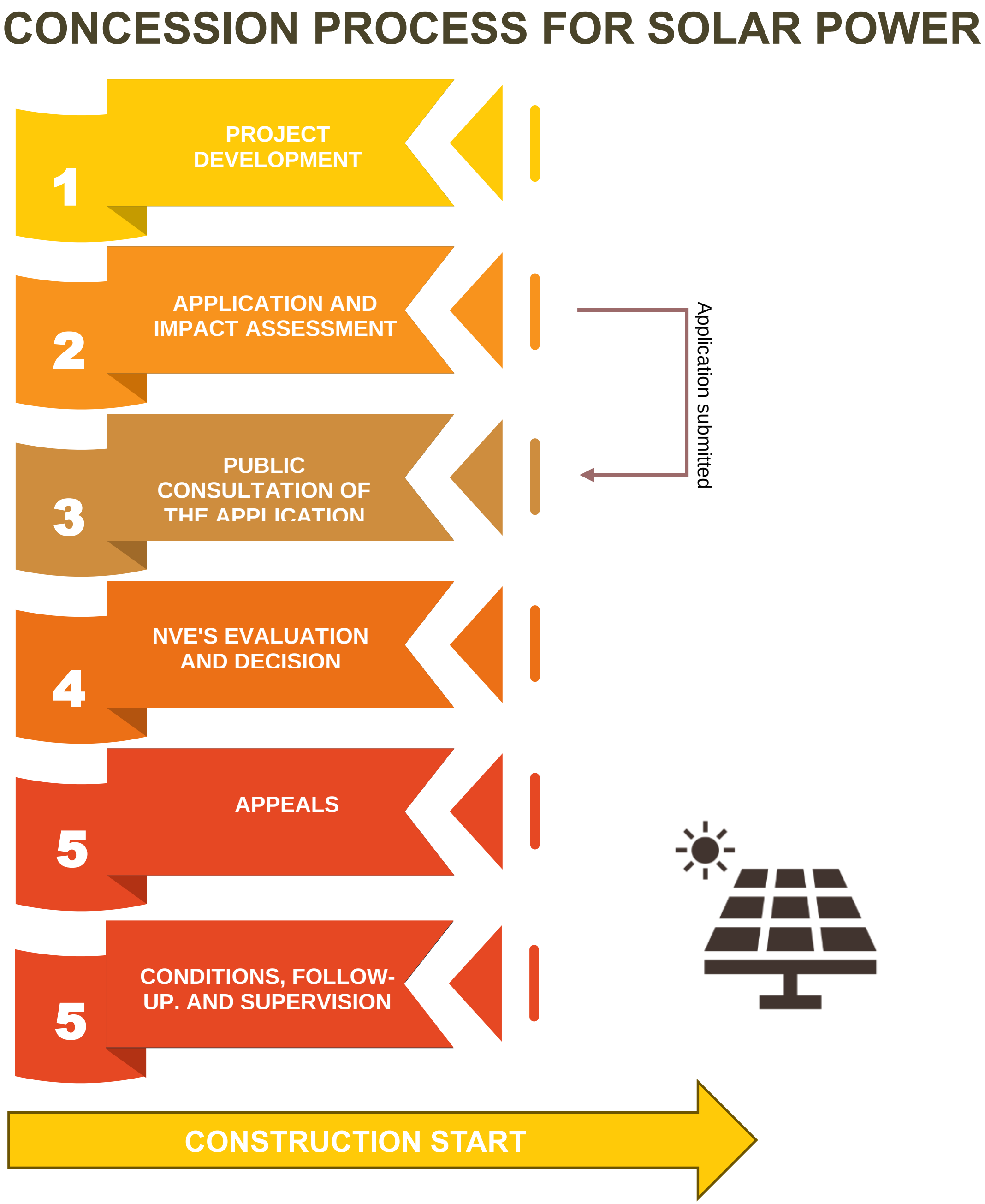


Exhibit 13 - Number of Wind Turbines corresponding to yearly production of project

Number of wind turbines corresponding to the yearly production of each project

	Wind turbines
Offshore wind (fixed)	516,4
Onshore wind	27,0
Ground-mounted Solar	0,5
Nuclear Energy	540,7

APPENDIX B – CONSULTANT REPORT

Exhibit 14 – Data Collection Methodology

	Description	Role	Processing
Internal Interviews	**6** qualitative interviews with Skagerak managers	Focused on strategy, finance, and corporate analysis	Transcribing and coding of interviews
External Interviews	**10** qualitative interviews with municipalities, startups, and academics	Explored policy, opposition, and renewable energy dynamics	Transcribing and coding of interviews
Online Survey	**308** respondents (Norway). Quantitative insights across demographics	Captured perspectives on social acceptance and energy preferences	Processed using Forsta, significance tested.
Literature	Data mixed from consulting reports and academic research	Consultancy reports, social acceptance, renewable energy market	Literature search through Google Scholar and Nova SBE Discovery

EXPERT INTERVIEWS

		Organization	Description	Title
Internal interviews: Skagerak Energi	1	Skagerak Energi Kraft	Heat and thermal energy division in Skagerak Energi	Senior Project Developer Renewable Energi
	2	Skagerak Energi Kraft	Developing the company's environmental strategy	Head of Environmental Affairs
	3	Skagerak Energi Kraft	Strategy division for long-term renewable projects	Head of Strategy Development
	4	Skagerak Energi	Corporate unit focusing on strategy and analysis	Head of Corporate Strategy and Analysis
	5	Skagerak Energi	M&A analysis and strategic energy investments	Senior M&A Analyst
	6	Skagerak Energi	Analysis Energy prices	Energy Analyst
External interviews: Norwegian actors	7	NVE - Norwegian Water Resources and Energy Directorate	Under the Norwegian Government and the Ministry of petroleum and Energy	Senior consultant
	8	Motvind	Organization opposing wind energy on land	Activist
	9	Fornybar Norge	Organization advocating for renewable energy in Norway	Executive Director Renewable Energy
	10	Telemark County Municipality	Responsible for Climate in region where Skagerak operates	Head of Climate, Business and Innovation
	11	Telemark County Municipality	Politicians in the region where Skagerak operates	Chairman of the Executive Committee for Business, Industry and Climate
	12	Larvik Municipality	Major and politician in region where Skagerak operates	Major Larvik Municipality
	13	Zero	Environmental NGO advocating sustainable energy policies	Energy Consultant
External interviews: International actors	14	CGEP, Columbia University	Global Energy Policy think tank	Policy Expert
	15	Windcredible's	Consultancy firm specializing in wind energy.	Founder
	16	Terravolt	Startup focusing on solar energy	Founder

Exhibit 15 – Overview of expert interviews

Exhibit 17 – Gender survey

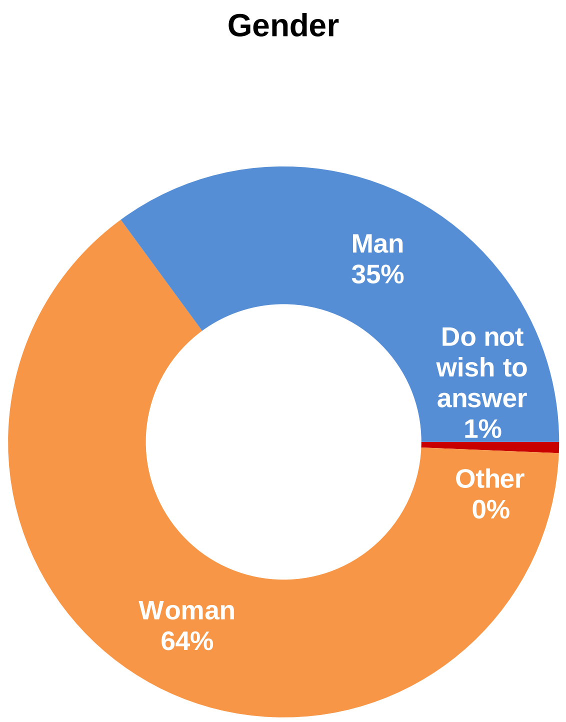


Exhibit 16- Age Survey

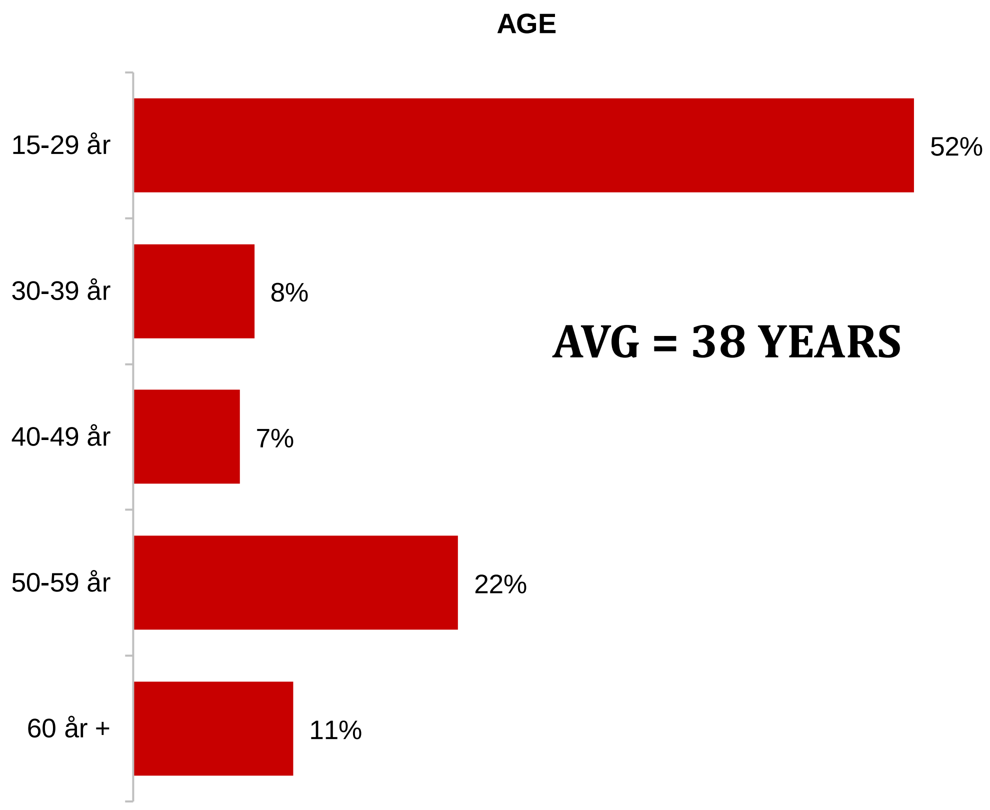


Exhibit 19 – County Distribution Survey Respondents

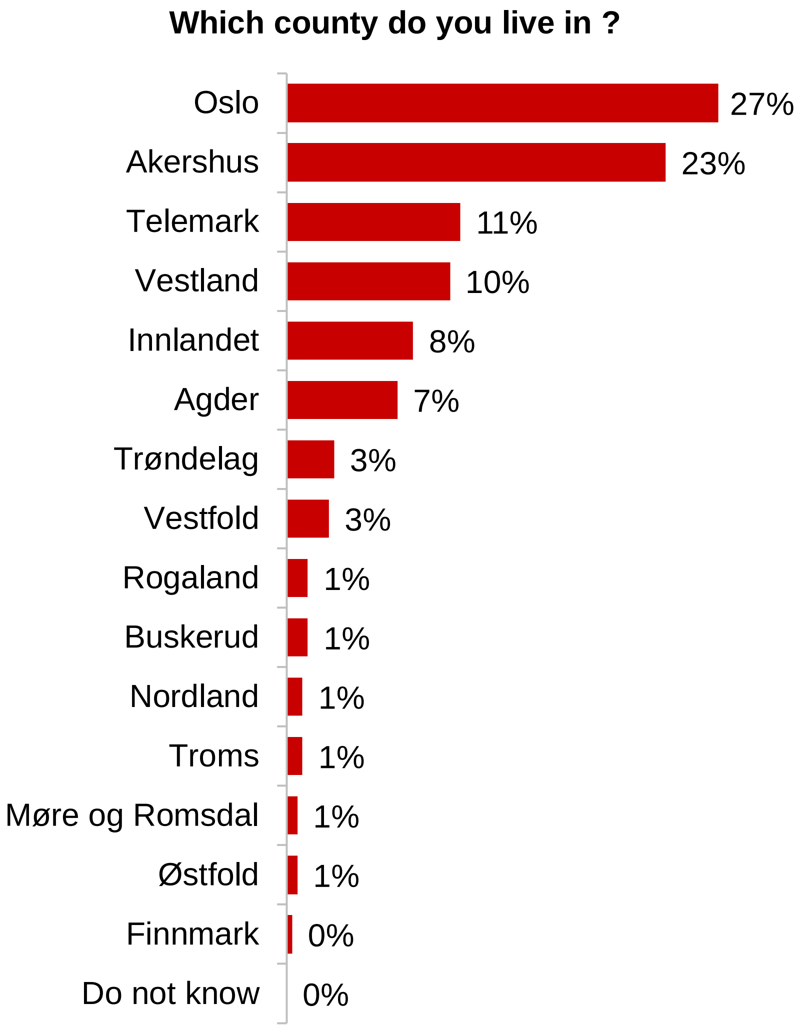


Exhibit 18 – City size Distribution Survey Respondents

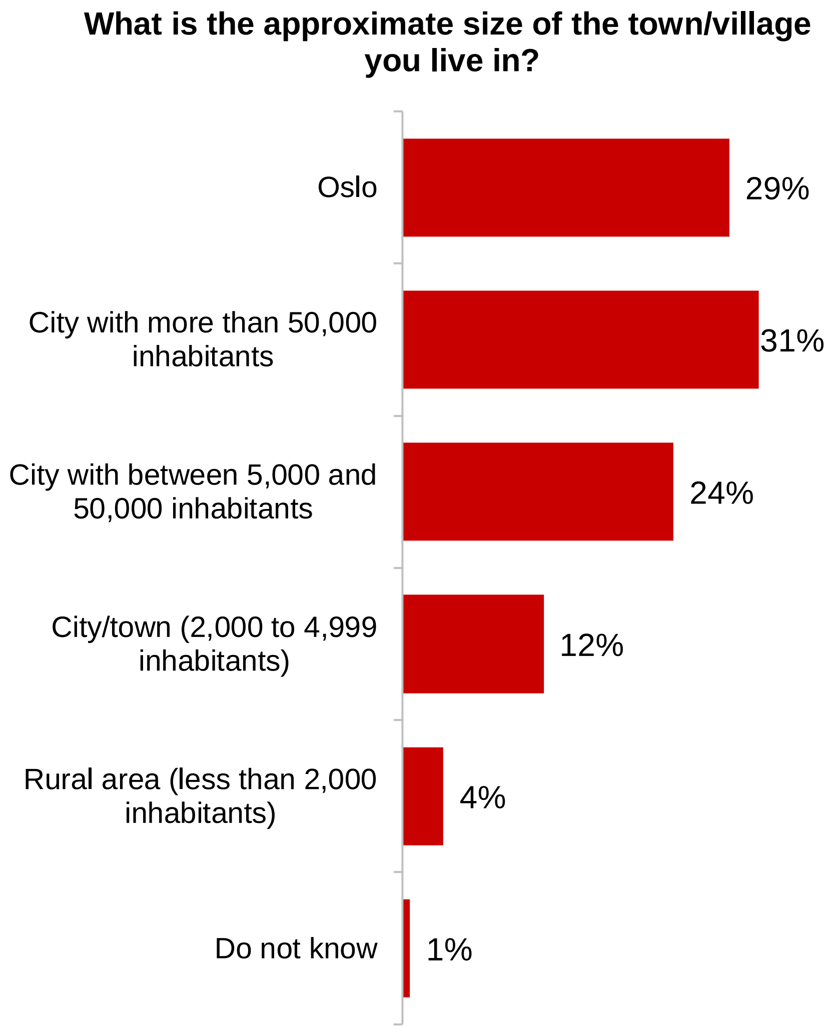


Exhibit 21 Employment, Survey Respondents

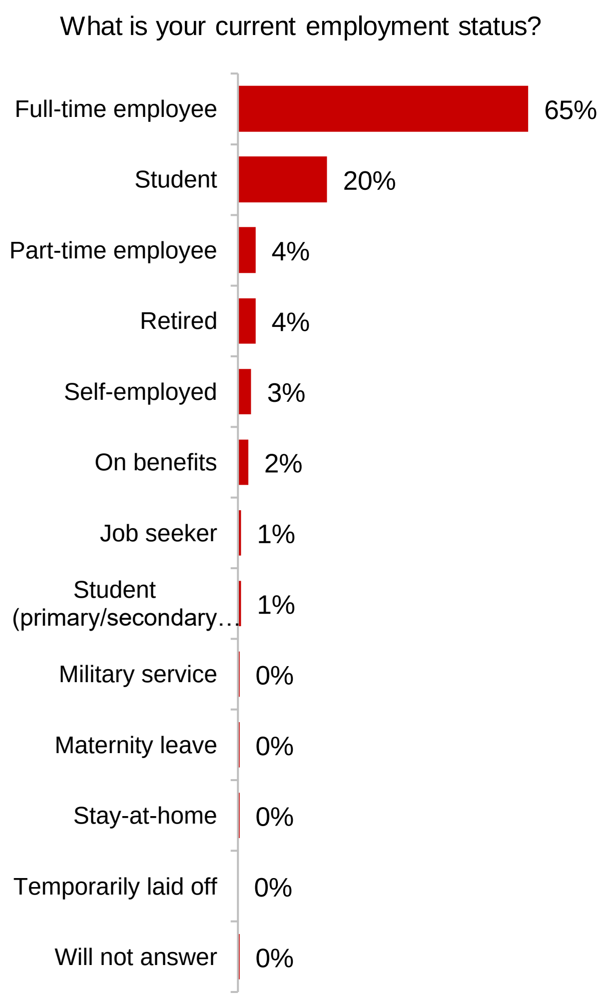


Exhibit 22 – Education, Survey Respondents

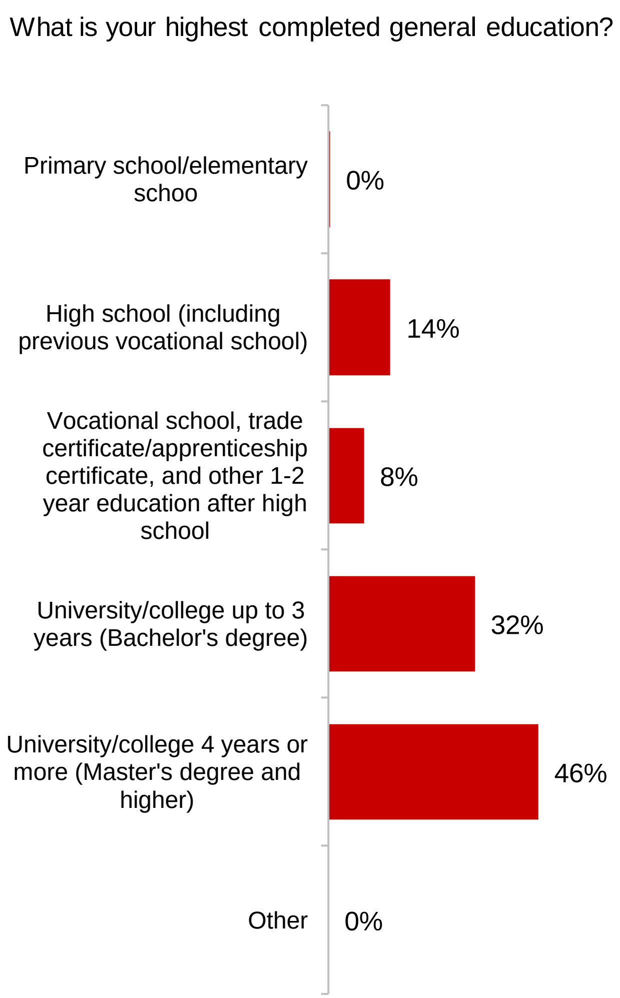


Exhibit 20 – Income, Survey Respondents

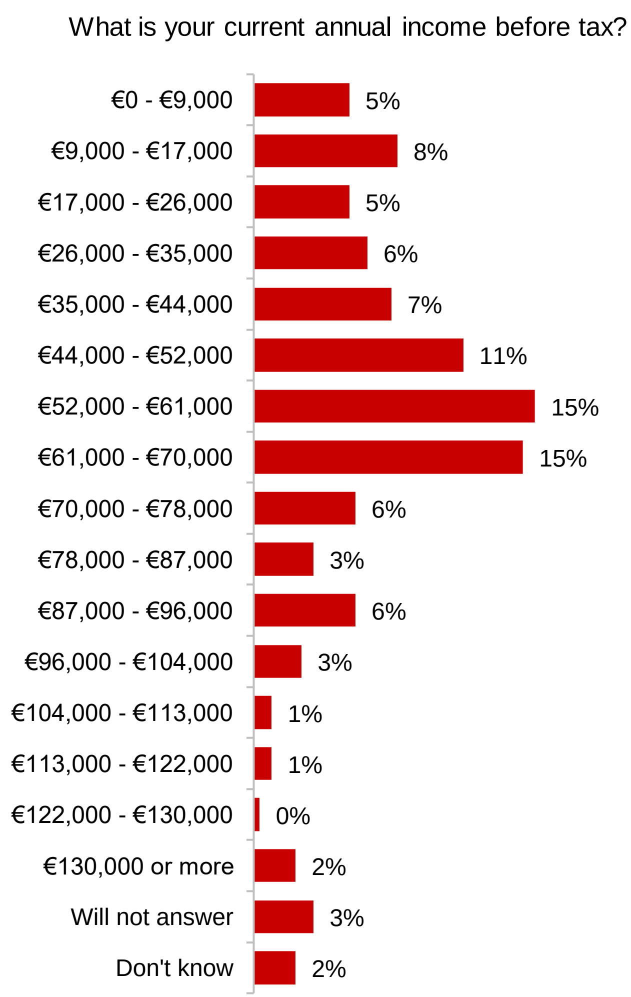


Exhibit 23 – Consumption of renewable energy topics

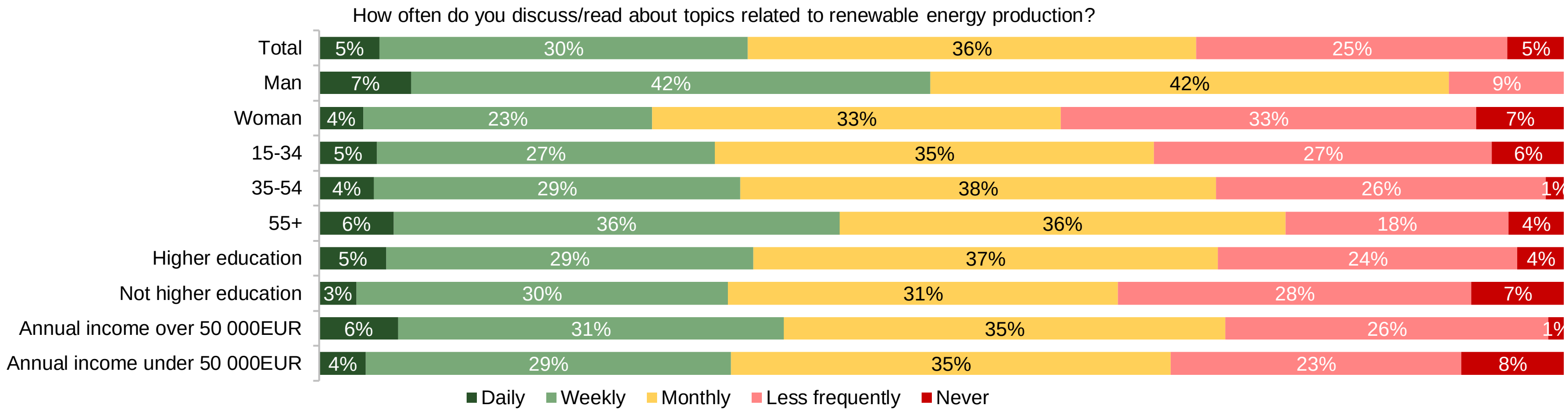


Exhibit 24 – Knowledge about Norwegian Energy market

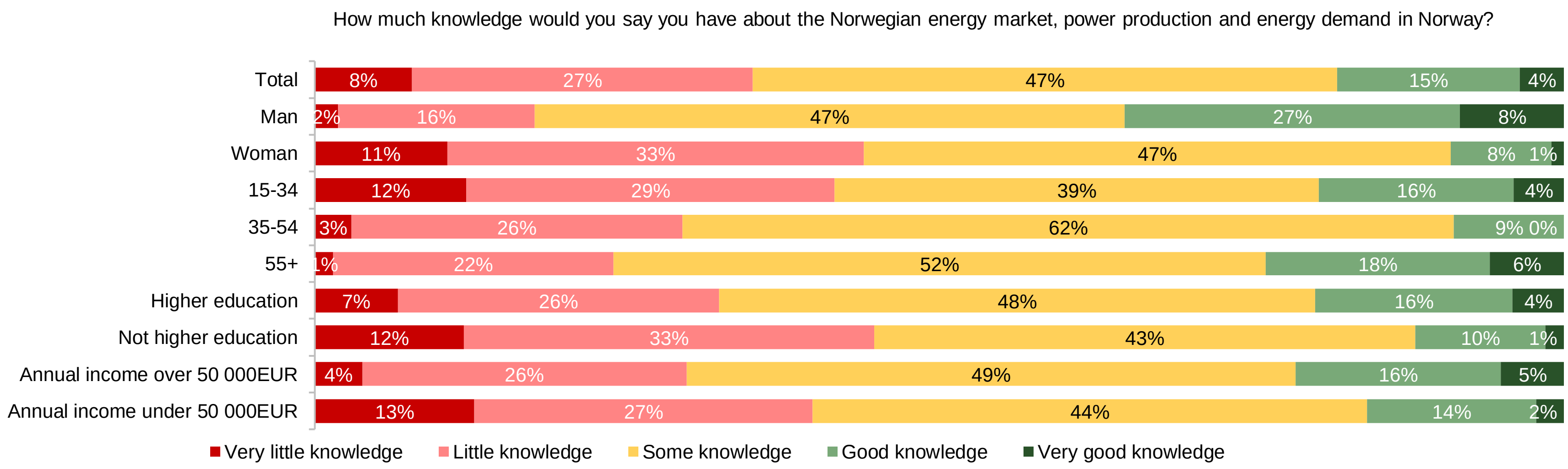


Exhibit 25 – Negative Factors Onshore Wind Energy

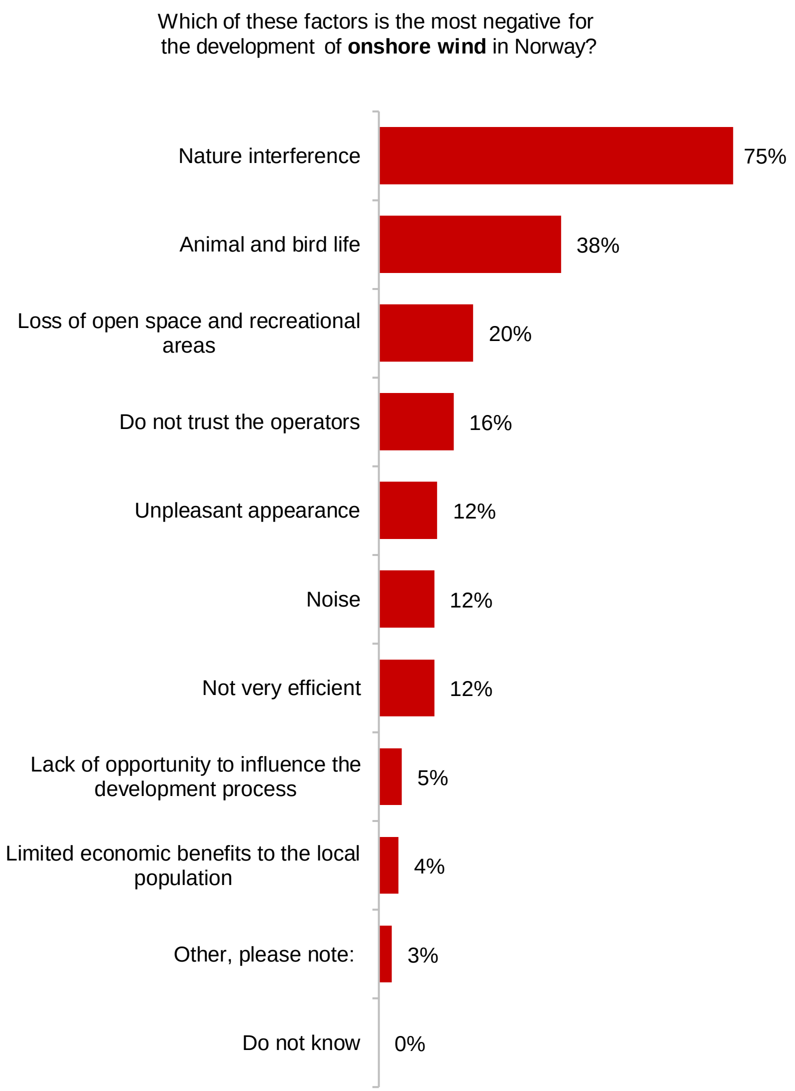


Exhibit 26 - Negative Factors Ground-mounted Solar Power Plants

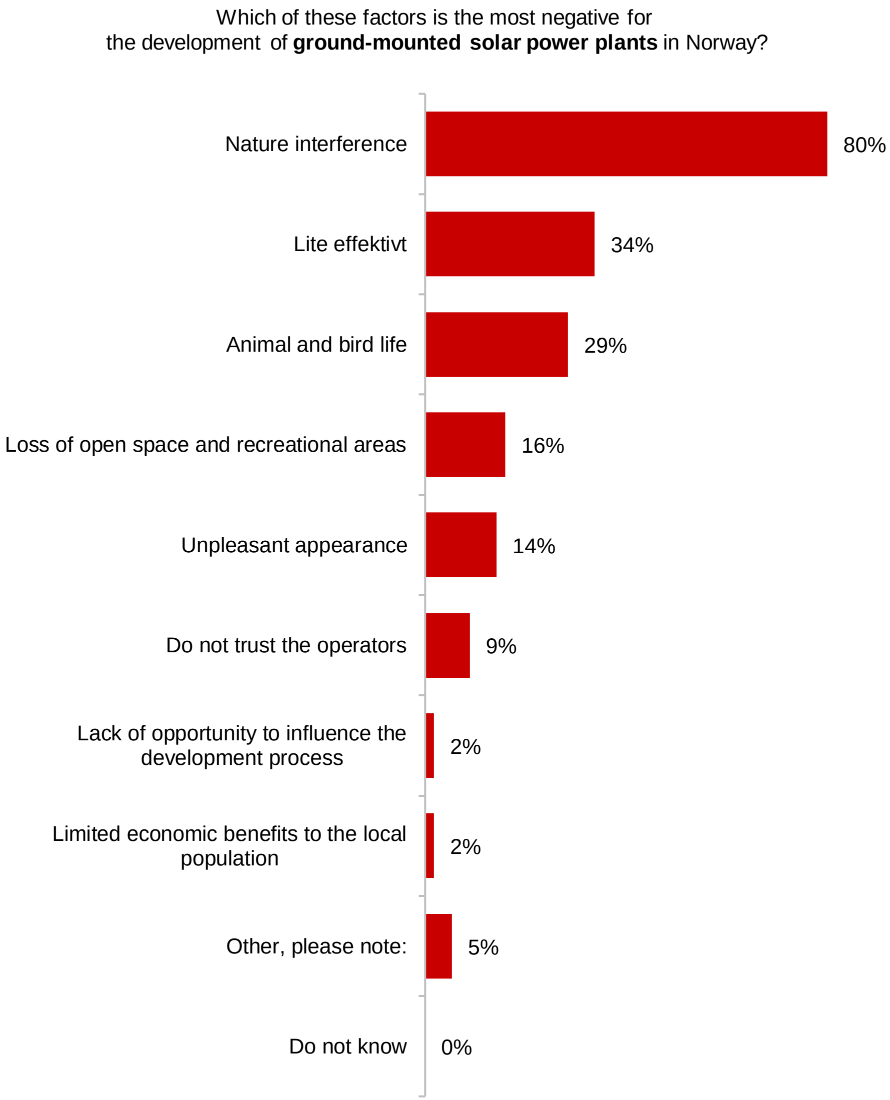


Exhibit 27 - Ranking of Preferred Energy Technologies

Which of the following energy production technologies are you most positive about as part of the future energy supply?
Rank from "most positive" to "least positive".

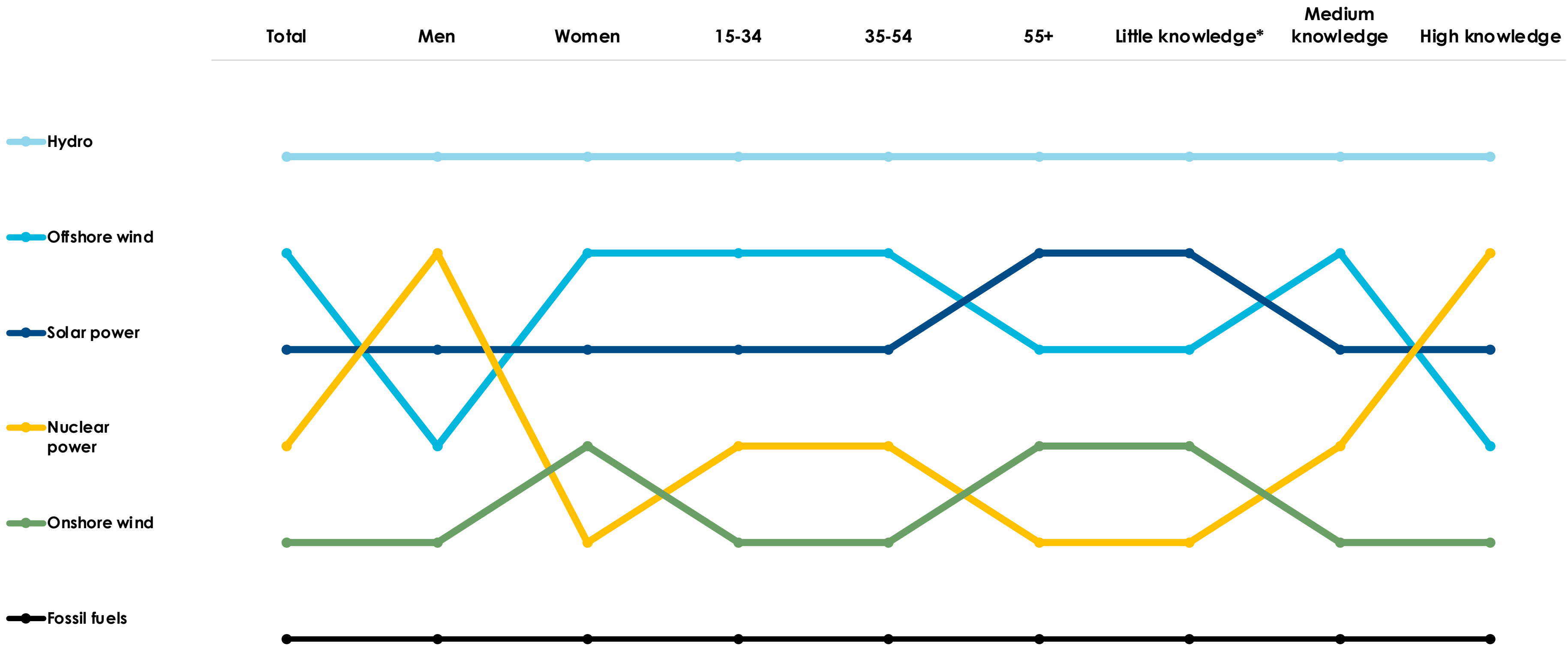


Exhibit 28 - Perception Solar and Onshore Wind Energy

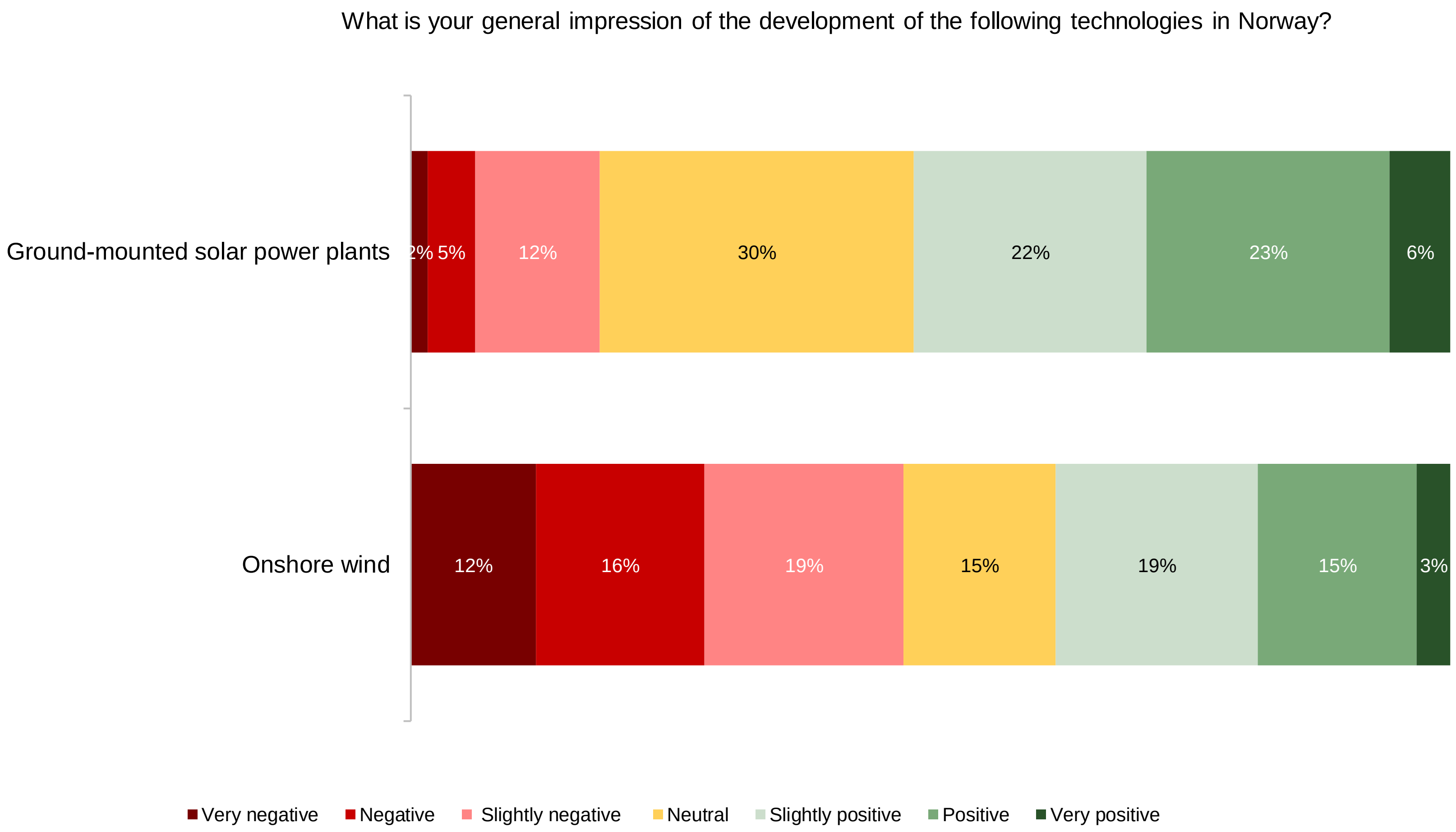


Exhibit 30 – Change of Perception, Energy Production Technologies

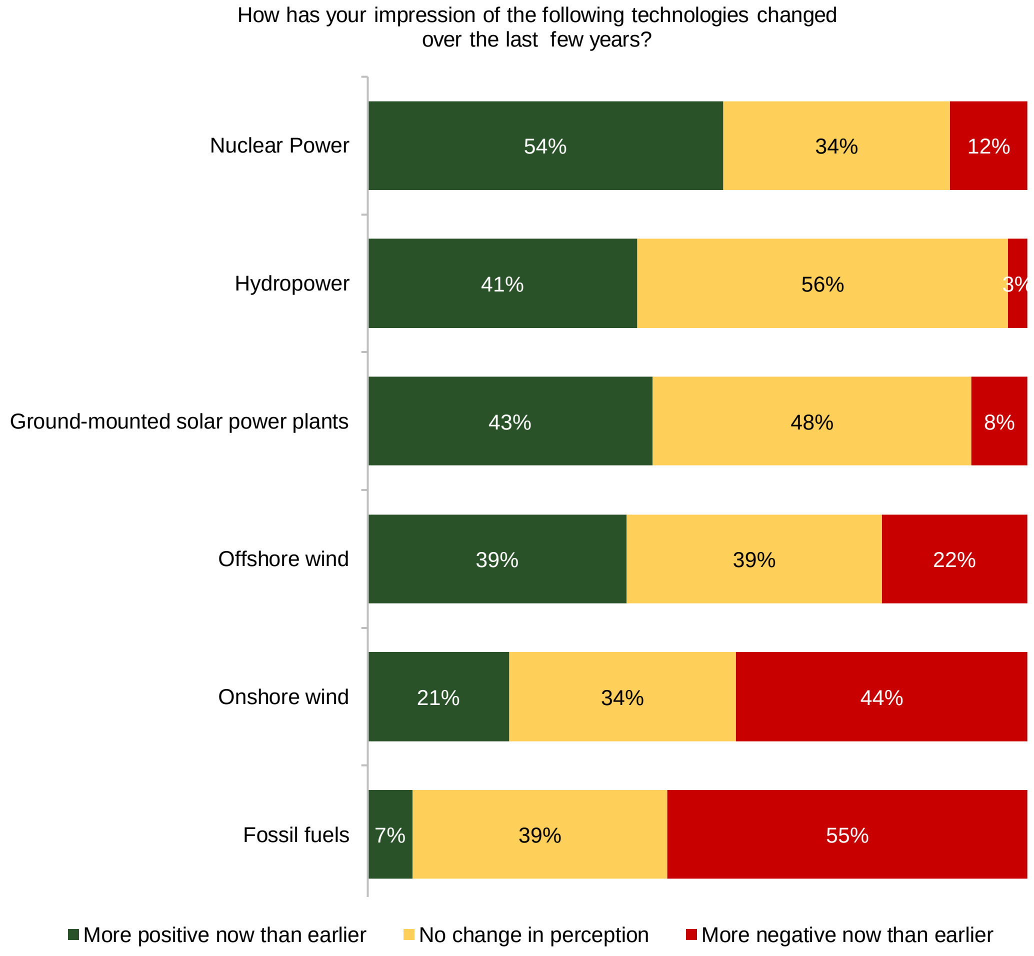


Exhibit 29 – Change of Perception, Energy Production Technologies – Net Impression

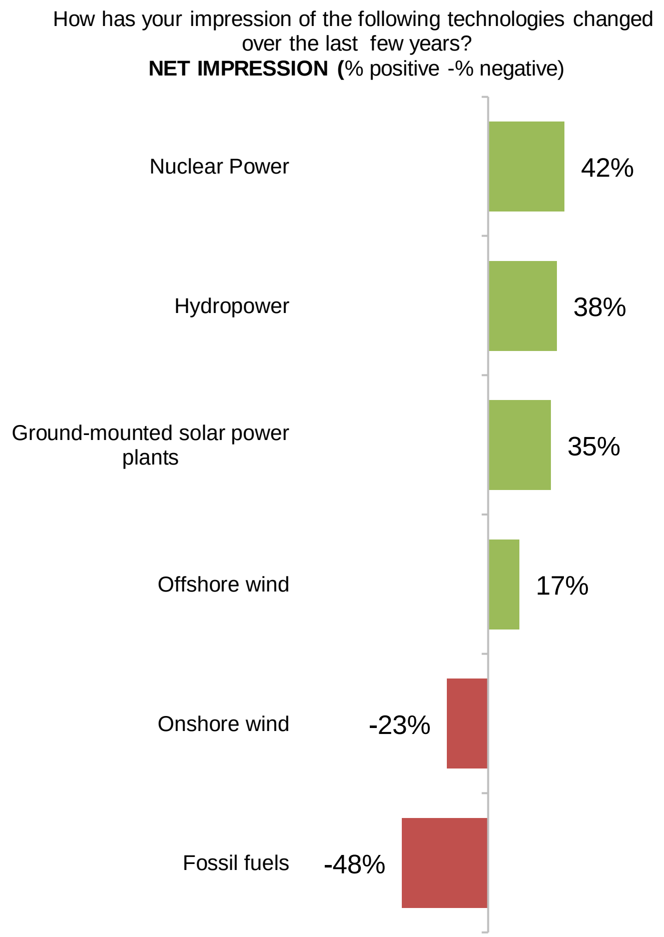


Exhibit 31 – Statements About Renewable Energy

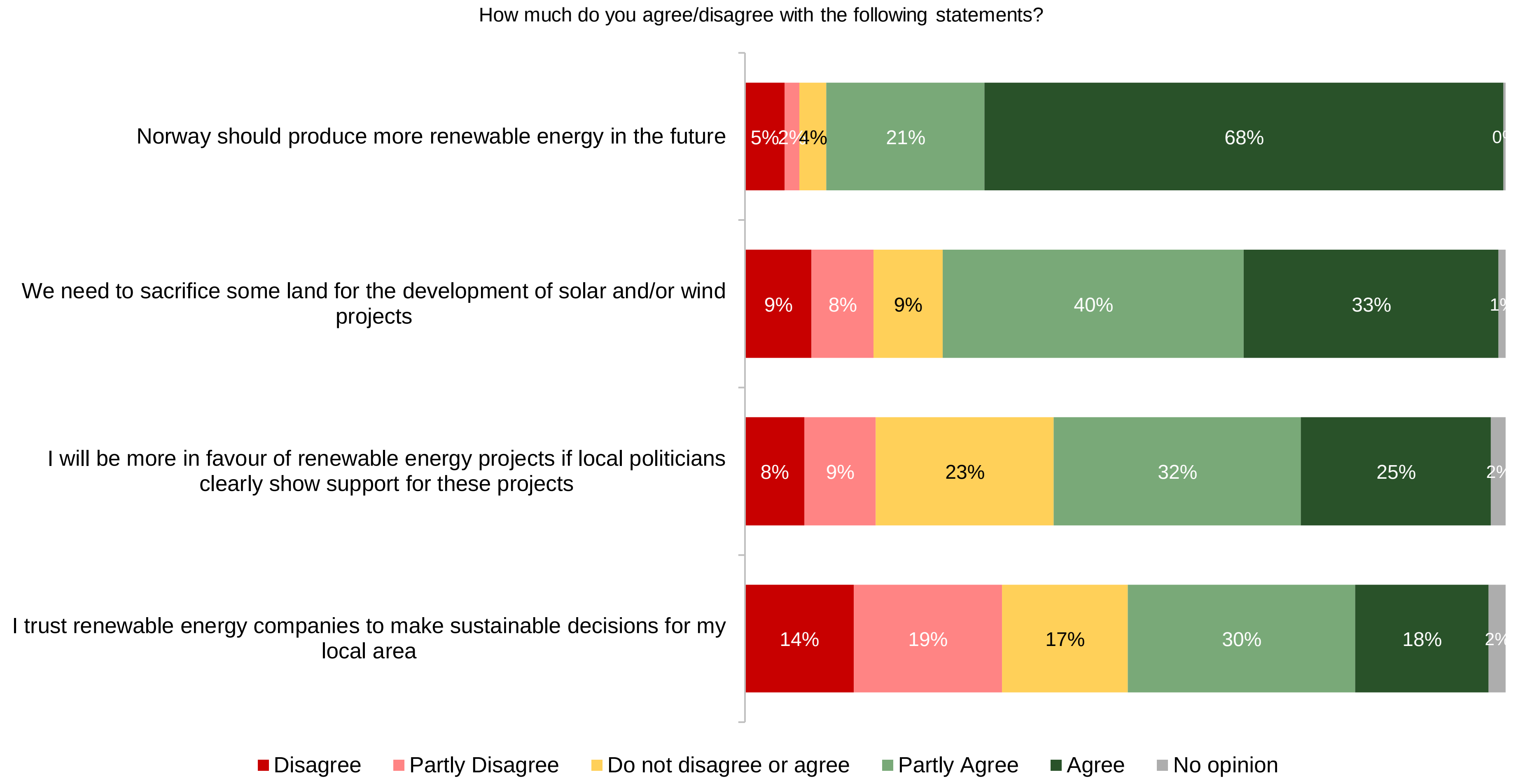


Exhibit 32 – Results from Coded Expert Interviews

RESULTS CODED EXPERT INTERVIEWS

Code	Description	Overall Frequency	Interviewee Mentions	Key Findings
T3	Government Subsidies	7	5	Government subsidies are necessary for project feasibility.
SAM	International Comparisons	9	5	International comparisons offer valuable insights.
T4	Research	10	7	Further research required to optimize renewable solutions.
H5	Land Use Challenges	11	6	Land use conflicts delay project deployment.
F4	Not in My Backyard (NIMBY) Resistance	12	7	NIMBY opposition limits local renewable projects.
SA4	Polarized Debate	12	7	Polarization hampers productive dialogue and action.
S2	Competitive Position	13	7	Competitive positioning enhances stakeholder confidence.
H2	Legal/Regulatory Constraints	14	8	Regulations create significant challenges for approval.
H3	Bureaucracy	15	9	Bureaucracy slows down renewable energy implementation.
SA3	Market Acceptance	15	9	Market conditions influence feasibility and support.
S1	Strategic Direction	16	9	Strategic alignment crucial for project success.
H1	Licensing Challenges	18	10	Complex licensing processes hinder progress.
T1	Technological Development	19	10	Technological innovation offers solutions for cost and efficiency.
F1	Local Profitability	20	10	Local benefits drive acceptance; key for social buy-in.
H4	Project Profitability	22	12	Profitability is a critical concern for all stakeholders.
SA2	Community Acceptance	24	13	Community acceptance ensures smoother implementation.
F2	Environmental/Nature Concerns	25	12	Environmental concerns are a significant resistance factor.
T2	Communication Efforts	28	14	Effective communication is needed to counter misinformation.
SA1	Sociopolitical Acceptance	32	12	Sociopolitical support is essential for renewable adoption.
F3	Knowledge Gap	43	13	Knowledge gap identified as a major barrier to acceptance.

*Overall frequency mentions: Number of mentions in total
** Interview mentions: Number of mentions in different interviews

Exhibit 33- Coded Expert Interviews Graph

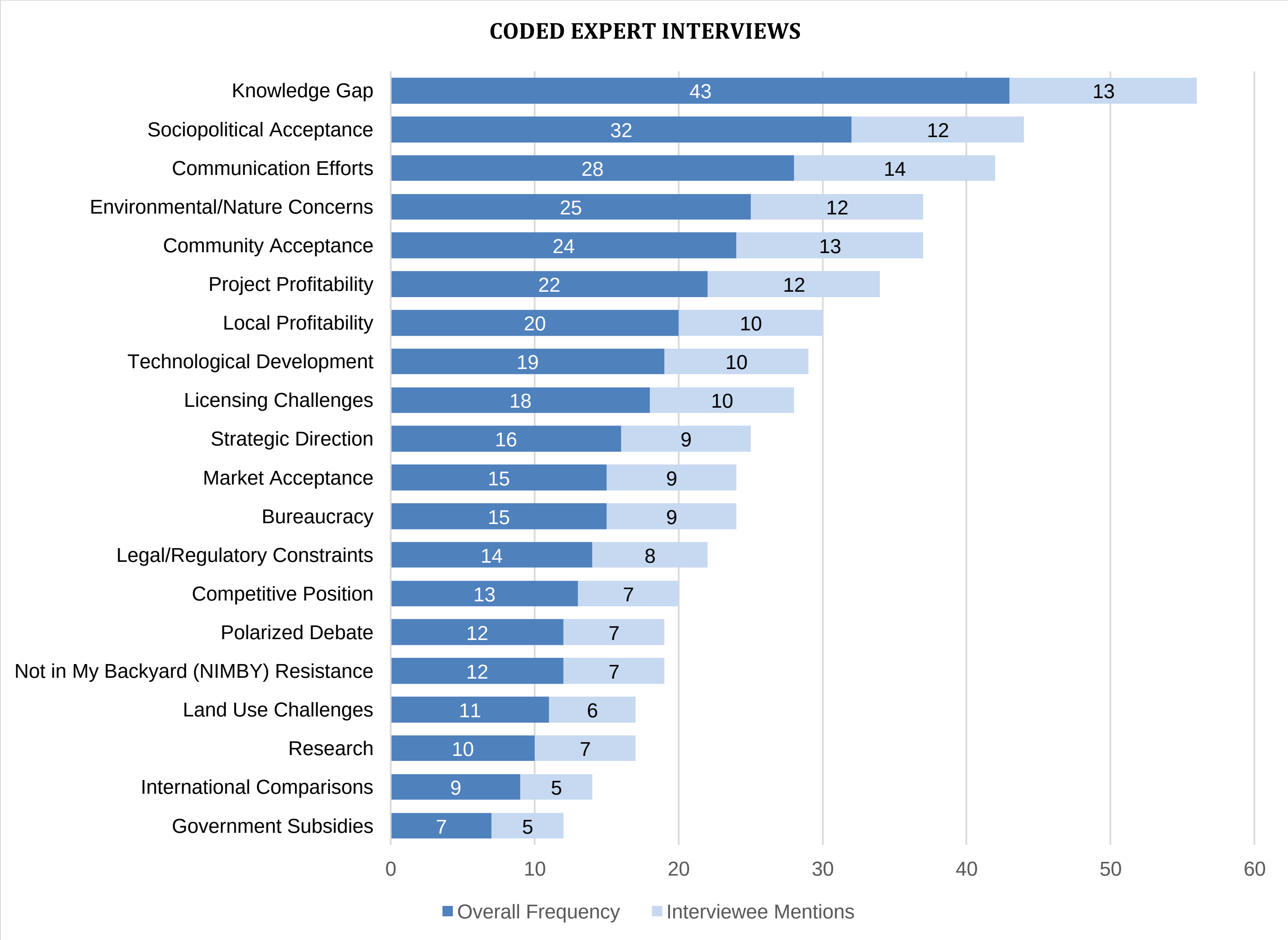


Exhibit 34 - Stakeholders Concern

Stakeholder	Key considerations	Relevance to social acceptance
Municipalities	Clear communication on local benefits (e.g., job creation, local taxes)	**Community Acceptance**: Municipalities need to see that renewable energy projects align with local needs, contributing to economic development and fairness in distributing benefits. Transparent decision-making processes and trust-building are key.
	Involvement in the decision-making process (engagement, consultations)	**Community Acceptance:** Ensuring procedural justice by involving municipalities in decision-making fosters trust and support for renewable energy projects at the local level
	Alignment with national/local energy policies	**Socio-political Acceptance**: Support from municipalities can enhance broader societal support, influencing national policy frameworks.
Industry	Regulatory clarity and stability for long-term investments	**Market Acceptance:** Industries, such as large energy users, need predictable policies to adopt renewable energy solutions. They also benefit from incentives or regulations that encourage investment in green energy technologies.
	Collaboration with renewable energy firms to meet sustainability goals (e.g., reducing emissions)	**Market Acceptance:** For industries to adopt renewable energy technologies, they need to see them as financially viable and beneficial for their long-term sustainability goals.
Renewable Energy Firms	Building trust with local communities and municipalities through transparency and engagement	**Community Acceptance:** Developers must demonstrate transparency in how projects impact local communities, fostering trust and addressing concerns.
	Creating partnerships with industrial actors for mutual benefits (job creation, local economic growth)	**Community Acceptance:** Effective partnerships with local industries help demonstrate the direct benefits of renewable energy projects to local communities, enhancing acceptance.
	Addressing public concerns about project impacts (visual, environmental, economic)	**Community Acceptance**: By addressing local concerns (e.g., visual pollution, environmental impacts), renewable energy firms can reduce opposition and improve public trust in the projects.
Public	Clear information on the societal benefits of renewable energy (e.g., energy security, climate change mitigation)	**Socio-political Acceptance:** Public acceptance often hinges on understanding the societal benefits of renewable energy, such as contributing to energy security and tackling climate change. Effective public communication campaigns can shape perceptions in favor of renewable energy.
	Ensuring fairness in benefit distribution (job creation, tax revenue)	**Community Acceptance:** Public support increases when communities see a fair share of the benefits from renewable energy projects. This involves addressing concerns of equity and ensuring that all stakeholders gain from the project.
	Reducing fears around the potential negative impacts (e.g., health, environment)	**Community Acceptance:** Public acceptance requires addressing concerns about negative impacts of renewable energy projects. Open dialogue and transparent planning can mitigate these concerns.

Exhibit 35- Economic Impact Analysis Framework

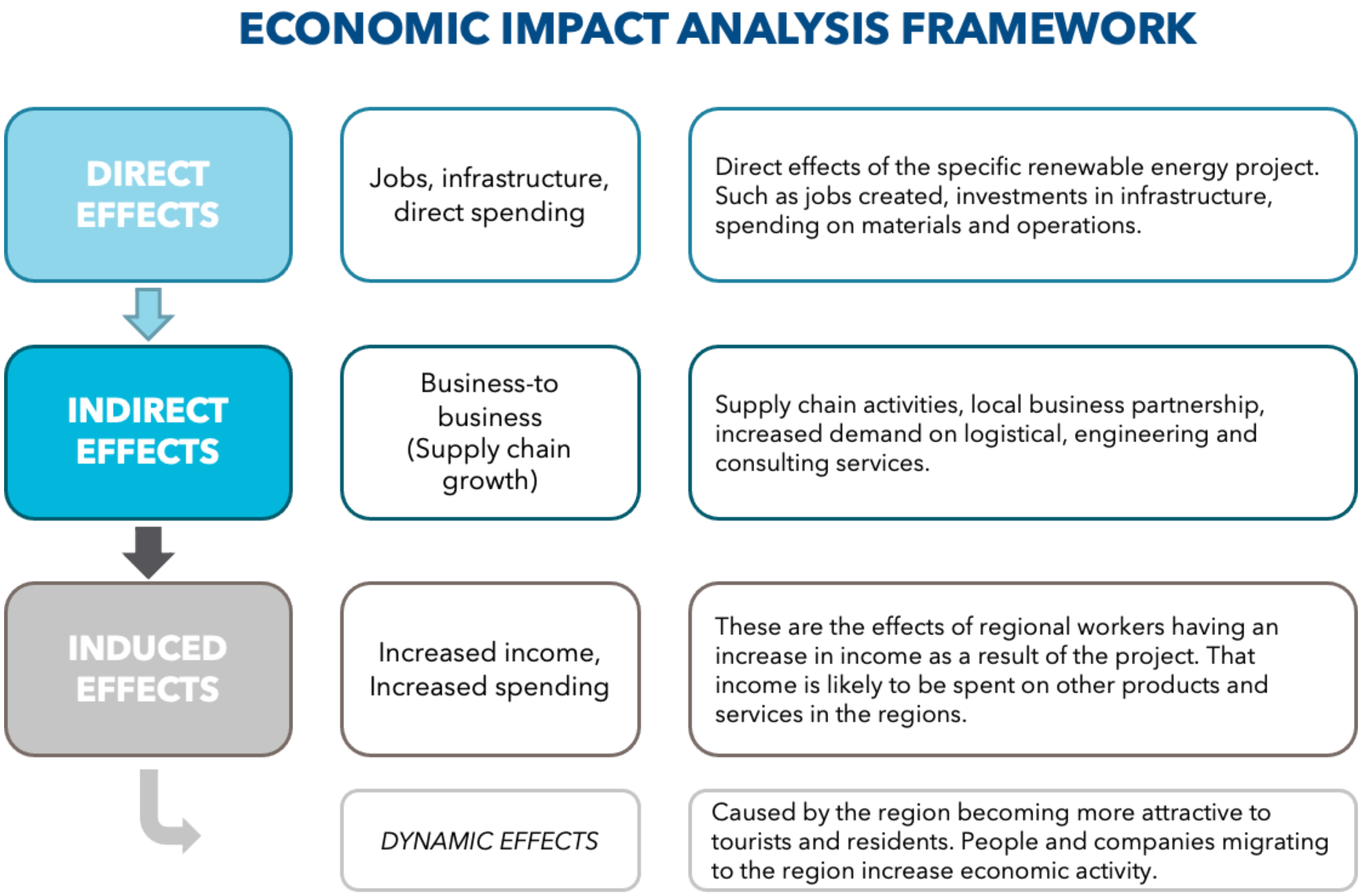


Exhibit 36 – Main Challenge developing Renewable Energy Projects

What interviewees describe as the main challenge developing new renewable energy projects - especially focusing on solar and onshore wind

Main Challenge	Description	Key Highlights
Social Acceptance	A majority of interviewees (12 out of 16) identified social acceptance as the main challenge for developing solar and onshore wind projects.	- **Local Resistance**: Strong local opposition to projects, often due to misinformation or lack of trust in developers. - **Misinformation**: Myths like wind turbines producing microplastics dominate discourse. - **Polarization**: The debate is highly polarized, making consensus difficult. Advocacy groups like "Motvind Norge" effectively mobilize resistance. - **Land Use Concerns**: Resistance to changes in land use, particularly for large-scale solar and wind projects on natural or agricultural land. - **Lack of Awareness**: Limited public understanding of the energy transition and its benefits. - **Strategies Suggested**: Education campaigns to improve public knowledge and emphasize local economic benefits; enhancing community engagement.
Profitability & Scalability	Financial viability and the ability to scale projects are key challenges noted by two interviewees.	- **Economic Barriers**: High upfront costs for solar installations and difficulty achieving profitability due to low efficiency and limited sunshine in some areas. - **Technology Costs**: While costs are decreasing, the pace is insufficient to make projects more viable quickly. - **Infrastructure Costs**: Investment in grid infrastructure for larger solar parks is prohibitive. - **Scalability in Developing Regions**: Limited funding and the need to address basic energy access before renewables make scalability a challenge, particularly in areas like Africa and Latin America.
Motvind's Opposition	Motvind, an opposition organization, argues against the need for new renewable energy projects. Instead, they emphasize reducing energy demand as a primary solution.	- **Focus on Demand Reduction**: Motvind highlights the view that Norway already produces sufficient renewable energy and additional projects are unnecessary. - **Advocacy**: Their efforts focus on stopping new renewable developments, particularly onshore wind, by mobilizing local resistance and influencing public debate.

Exhibit 37 - Road Map Recommended Action Points

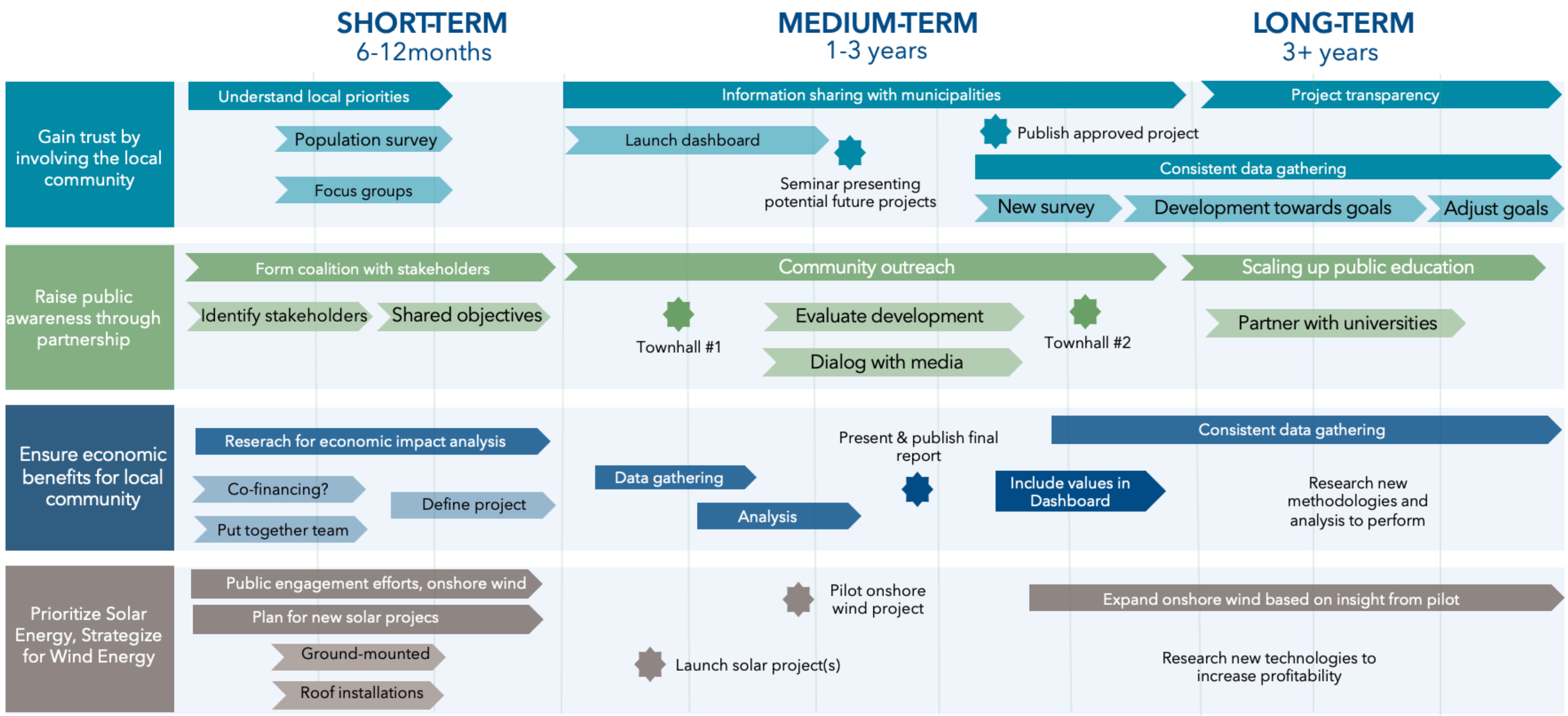


Exhibit 38 - Impression of Onshore wind - Demography

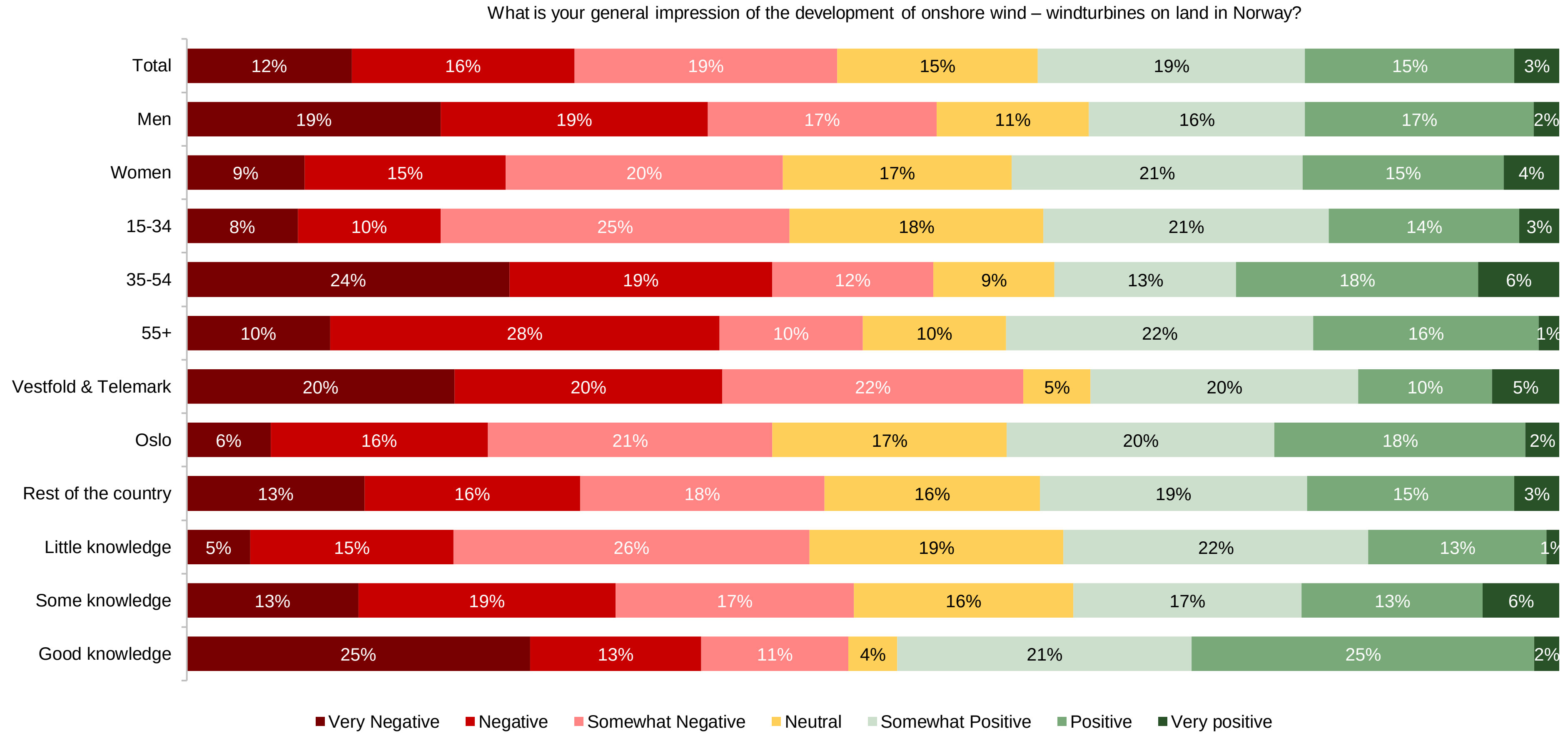
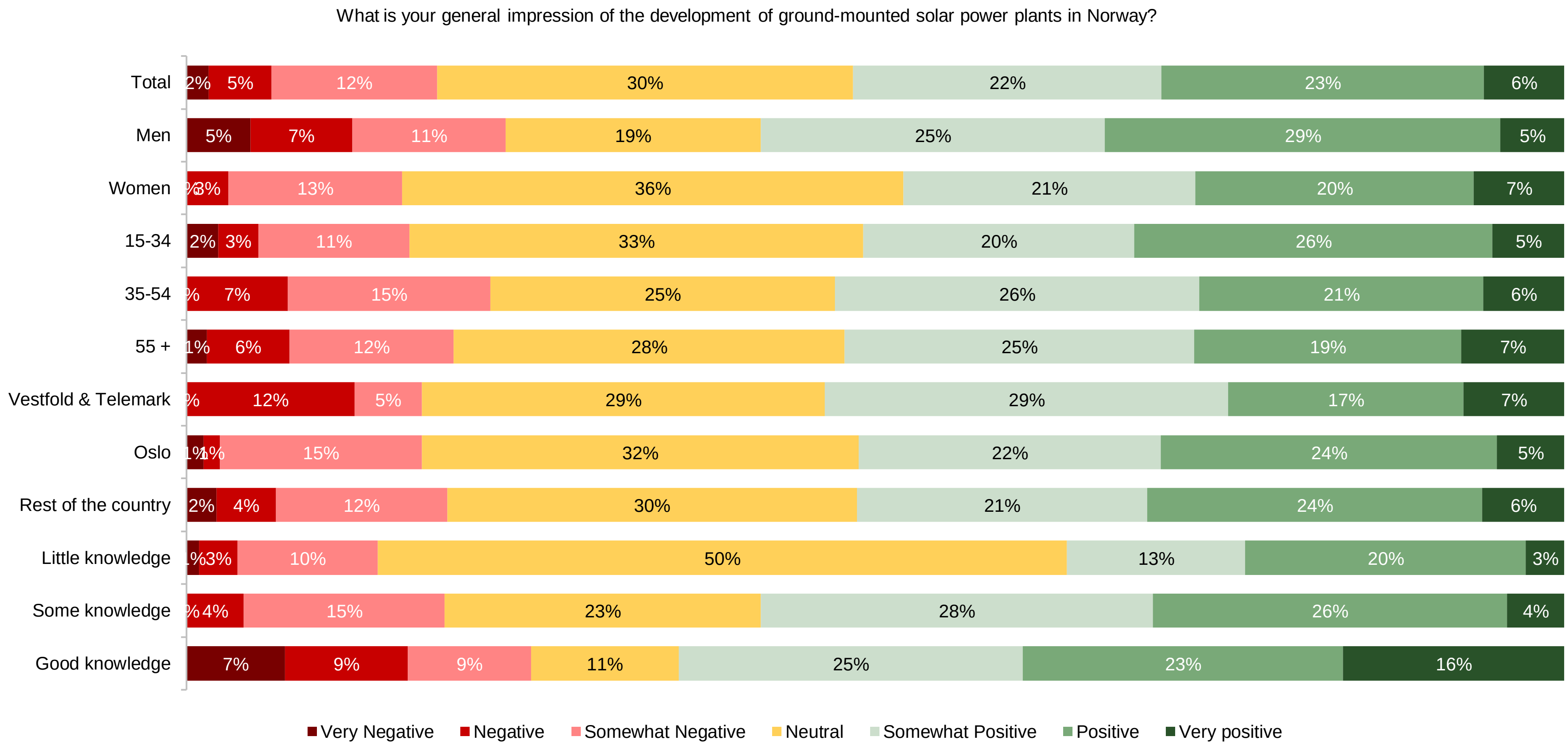


Exhibit 39 - Impression of Ground-Mounted Solar Energy - Demography



APPENDIX C – TEACHING NOTE:

TN2 - Exhibit 1 – NPV Offshore Wind

Project 1: Fixed Offshore Wind			
Capacity (MW)	1500		
Capacity Factor	0,51		
Economic lifetime (Years)	30		
Hours per year	8760		
Yearly productionn (MW)	6701400		
Investment amount (EUR/kW)	4 905		
Investment amount (EUR/MW)	4 904 835		
CAPEX	**7 357 252 950**		
Operating and Maintenance Cost [EUR/kWh]	0,016207		
Fuel Cost [EUR/kWh]	0		
Operating and Maintenance Cost [EUR/MWh]	16,207		
Fuel Cost [EUR/MWh]	0		
OPEX (MWh)	**108 609 590**		
	Low	Medium	High
Price per MWh	€ 47,00	€ 57,50	€ 68,00
Revenue	**€ 314 965 800**	**€ 385 330 500**	**€ 455 695 200**
Net Profit	**€ 206 356 210**	**€ 276 720 910**	**€ 347 085 610**
r	**0,06**		
	Scenario: Low	Scenario: Medium	Scenario: Hgh
PV	2 840 458 390	3 809 016 605	4 777 574 820
NPV	**(4 516 794 560)**	**(3 548 236 345)**	**(2 579 678 130)**

TN2 - Exhibit 2 - NPV Onshore Wind

Project 2: Fixed Onshore Wind						
Capacity (MW)		100				
Capacity Factor		0,4				
Economic Lifetime (Years)		30				
Hours per year		8760				
Yearly productionn (MW)		350400				
Investment amount (EUR/kW)		1 162				
Investment amount (EUR/MW)		1 161 957				
CAPEX		**116 195 660**				
Operating and Maintenance Cost [EUR/kWh]		0,009383				
Fuel Cost [EUR/kWh]		0				
Operating and Maintenance Cost [EUR/MWh]		9,383				
Fuel Cost [EUR/MWh]		0				
OPEX (MWh)		**3 287 803**				
	Low		Medium		High	
Price per MWh	€	47,00	€	57,50	€	68,00
Revenue	**€**	**16 468 800**	**€**	**20 148 000**	**€**	**23 827 200**
Net Profit	**€**	**13 180 997**	**€**	**16 860 197**	**€**	**20 539 397**
r		**0,06**				
	Scenario: Low		Scenario: Medium		Scenario: Hgh	
PV		181 434 195		232 077 762		282 721 329
NPV		**65 238 535**		**115 882 102**		**166 525 669**

TN2 - Exhibit 3- NPV Solar Energy

Project 3: Solar						
Capacity (MW)		6,1				
Capacity Factor		0,11				
Economic Lifetime		30				
Hours per year		8760				
Yearly productionn (MW)		5877,96				
Investment amount (EUR/kW)		566				
Investment amount (EUR/MW)		565 710				
CAPEX		**3 450 829**				
Operating and Maintenance Cost [EUR/kWh]		0,011942				
Fuel Cost [EUR/kWh]		0				
Operating and Maintenance Cost [EUR/MWh]		11,942				
Fuel Cost [EUR/MWh]		0				
OPEX (MWh)		**70 195**				
	Low		Medium		High	
Price per MWh	€	47,00	€	57,50	€	68,00
Revenue	**€**	**276 264**	**€**	**337 983**	**€**	**399 701**
Net Profit	**€**	**206 070**	**€**	**267 788**	**€**	**329 507**
r		**0,06**				
	Scenario: Low		Scenario: Medium		Scenario: Hgh	
PV		2 836 512		3 686 058		4 535 604
NPV		**(614 316)**		**235 229**		**1 084 775**

TN2 - Exhibit 4 - NPV Nuclear Energy

Project 4: Nuclear						
Capacity (MW)		900				
Capacity Factor		0,89				
Economic Lifetime		40				
Hours per year		8760				
Yearly productionn (MW)	€	7 016 760				
Investment amount (EUR/kW)		10 025				
Investment amount (EUR/MW)		10 024 712				
CAPEX		**9 022 240 710**				
Operating and Maintenance Cost [EUR/kWh]		0,017913				
Fuel Cost [EUR/kWh]		0,003412				
Operating and Maintenance Cost [EUR/MWh]		17,913				
Fuel Cost [EUR/MWh]		3,412				
OPEX (MWh)		**149 632 407**				
	Low		Medium		High	
Price per MWh	€	47,00	€	57,50	€	68,00
Revenue	**€**	**329 787 720**	**€**	**403 463 700**	**€**	**477 139 680**
Net Profit	**€**	**180 155 313**	**€**	**253 831 293**	**€**	**327 507 273**
r		**0,06**				
	Scenario: Low		Scenario: Medium		Scenario: Hgh	
PV		2 710 670 322		3 819 220 990		4 927 771 657
NPV		**(6 311 570 388)**		**(5 203 019 720)**		**(4 094 469 053)**

TN2 - Exhibit 5 - Risk mapping

Risk Category	Offshore Wind	Onshore Wind	Solar Energy	Nuclear
Regulatory Risks	High	High	Moderate	High
Market Volatility	High	High	High	Moderate
Technological Risks	High	Moderate	Low	High
Community and Social Acceptance	Moderate	Very high	Moderate	High
Dependency on Subsidies	High	Moderate	Moderate	Moderate
Environmental Impact	Moderate	High	Low	Moderate
Capital Intensity	Very High	Moderate	Low	Very High
Operational Risks	High	Moderate	Low	High

TN2 - Exhibit 6 - Examples of Roles for Role Play Activity

ROLES FOR ROLEPLAY
Skagerak -Finance and economy department
Skagerak – CEO
Skagerak – Corporate Strategy
Landowner
Municipality
Yara – regional industry player
Motvind – opposition group
Ministry of Energy