CONSUMER EXPECTATIONS AND ACTIONS CATALYZING AN ENERGY TRANSITION TOWARDS A RENEWABLE AND SUSTAINABLE ENERGY SYSTEM

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International Business
Bachelor's Thesis
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Title of Thesis: Consumer Expectations and Actions Catalyzing a Transition Towards a Renewable and Sustainable Energy System

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Objectives
The main objectives of the study were to analyze how energy consumers contribute to a sustainable energy transition. More specifically, what the current consumer perceptions are and how they incite sustainable action amid consumers and in the energy industry.

Summary
The research surveyed private energy customers with the aim to find out their current knowledge, values, and actions related to sustainability and energy. In addition, a qualitative semi-structured interview was conducted with an industry specialist, with the aim to figure out how consumers contribute to the actions made by energy companies. Both research methodologies were created based on the scientific background and conceptual framework built in the literature review.

Conclusions
Based on the quantitative and qualitative analysis, it was found that energy consumers are largely concerned about the environment and climate change, but their knowledge regarding the energy sector remained relatively low. In addition, it was found that sustainable and renewable options are of interest to most energy consumers, with some even being willing to produce their own energy if they had the option. Based on the research, the change in consumer preferences has put a high strain on energy companies to turn to sustainable and renewable solutions.

Key words: sustainability, energy industry, renewable energy, energy transition, consumer behavior, prosumers

Language: English

Grade:
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1. INTRODUCTION

1.1. Background

Environmental concerns are at their peak, with the high and constant depletion of environmental resources. There has been an increase in environmental problems due to a combination of many different factors, such as an increase in population, energy consumption and industrial activities (Jaber et al., 2003). Sustainable energy is crucial when it comes to protecting the environment, since the energy industry produces a substantial amount of carbon dioxide and air pollution. According to a report made by OECD, IEA, and IIASA (2016), energy production and energy use is currently the most significant source of air pollution that originates from human activity. Thus, it is crucial that energy companies take sustainable measures when it comes to the energy process and that energy consumers, both private and business, make sustainable changes in their energy end-use.

Consumer knowledge has been increasing in the last decades regarding sustainability issues but remains low regarding the energy sector and its different aspects. For example, it has been found in prior studies that there is a relative lack of knowledge of renewable energy by consumers (Bang et al., 2000). Consumer knowledge is an important factor that should be taken into account in all industries since it affects all the aspects of consumer behavior. Thus, it is important for companies to educate their consumers on important issues relating to their industry. This is especially important in the energy sector which is multifaceted and includes numerous options for consumers. Additionally, it is important to know consumer perceptions when deciding a way of conducting business, since a company’s customers essentially drive its success.

A sustainable energy transition is needed in the industry, and this transition can be achieved by both companies in the industry and their consumers. This study will address this issue, mainly, from a consumer-change point of view of what is driving that transition. This point of view takes the consumer knowledge, expectations and actions into consideration. Additionally, this study will briefly examine how energy companies can take the shift in customer preferences into account to create benefit.

1.2. Research Problem
It is largely known that sustainable solutions are needed in polluting industries, such as the energy industry. However, still a wide array of reasons prevail as to why a sustainable energy transition has not yet fully occurred. Nonetheless, consumer perceptions will most likely have an effect on energy companies, regardless of if the companies are aware of these perceptions or not. Therefore, it is crucial for companies to know how they can take action to enhance their prioritization of consumer perceptions.

There have been previous general studies on consumer expectations and how it affects consumer action. However, in the energy sector, this phenomenon is not widely researched. With the rise of more sustainably conscious and actively participating consumers, it is apparent that it will force companies to adapt to these changes. To address this issue, it is important to first establish the existing consumer perceptions.

This thesis aims to analyze the different factors affecting the transition towards sustainable energy systems. More specifically, how consumer expectations and actions contribute to the change.

1.3. Research Questions
In this thesis a sustainable energy transition and consumer behavior is the area of study. The research questions are the following:

RQ1. What factors drive a sustainable energy transition?
RQ2. What are the current perceptions of sustainable energy and how does it incite action amid consumers?
RQ3. To what extent are consumer expectations and actions affecting energy companies’ sustainable and renewable choices?

1.4. Research Objectives
The research objectives of the study are the following:

RO1. To identify the different factors affecting the transition towards sustainable energy systems.
RO2. To analyze consumer knowledge, values and actions related to sustainability and energy.
RO3. To analyze how the energy sector can take sustainability and consumers into consideration in their actions.

1.5. Definitions
Energy industry: The energy industry includes all companies involved in the production and sale of energy. This encompasses fuel extraction, manufacturing, refining, marketing, storage, transportation, and distribution of any type of energy (MSCI, 2018).

Renewable energy: Renewable energy is energy that comes from natural resources, such as sunlight, wind, rain, waves, tides and geothermal heat (Lund, 2010). Renewable energy is naturally replenished within a certain period of time.

Sustainable energy: Sustainable energy is energy that can be reused innumerable times, without endangering the source of getting depleted, expired or vanished (Junejo et al., 2018). Essentially, sustainable energy is energy production that can persevere in the long-term. Most renewable energy sources can therefore be considered sustainable sources of energy, since they are not limited in their use. However, some renewable energy sources can become unsustainable if they are used faster than they can be renewed.

Energy transition: The energy transition is defined as a shift in the global energy sector from fossil-based energy systems towards renewable energy sources in both production and consumption, while also maximizing the opportunities available from increased energy efficiency and better management of energy demand (UIA, 2015).

Prosumer: A prosumer is an active energy consumer, who both consumes and produces electricity (Šajn, 2016). A wider understanding of prosumers includes all energy consumers who also participate actively in the market, and thus generate value for themselves or for other actors in the energy market (ibid).

2. LITERATURE REVIEW
The purpose of this literature review is to conduct a structured review of available literature regarding environmental sustainability in the energy industry, and how consumer expectations and actions drive a sustainable change in the industry. The central aim of this literature review is to answer RQ1 and fulfill RO1.

Firstly, the literature review will analyze the definition of sustainability and how it is measured in the energy industry. Secondly, the reasons for the lack of sustainability in the energy industry will be established, and following that, the importance of introducing sustainable measures to the industry. Thirdly, the literature review will analyze consumer and prosumer contribution in the energy industry. Lastly, the literature review will provide a general outlook on the sustainable energy transition in the industry, with insights to different energy sources and on the significance of energy-end use.

2.1. Definition of Sustainability in the Energy Industry

In order to achieve sustainability in the energy industry, it is important to define what sustainability means and how it can be measured. Once the definition and measures have been attained, sustainable endeavors can be more easily facilitated. The World Commission on Environment and Development (1987) defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. This exact definition by WCED is used in many reports as a basis when defining sustainability. The United Nations Environment Programme (2015) adds to this definition in the ESES (Environmental, Social and Economic Sustainability) Framework. The framework is based on the three-pillar approach which indicates that sustainable development includes environmental, social and economic factors. This means that when trying to achieve sustainability in the energy industry, all three of these factors should be taken into consideration.

A book focused on sustainable energy resources and technologies (Tester et al., 2012) gives the following definition for sustainable energy: “A dynamic harmony between the equitable availability of energy-intensive goods and services to all people and the preservation of the earth for future generations.” This indicates that sustainable energy should focus on energy security and avoid unnecessary environmental harm. This
specific definition of sustainable energy aligns with the definition of sustainability created by The World Commission on Environment and Development in 1987.

One of the 17 Sustainable Development Goals (SDGs) created by the United Nations Development Programme in 2012, Goal 7, targets affordable and clean energy. In order to achieve this goal, the UNDP (2021) states that it is crucial to invest in renewable energy sources, improve energy productivity, and ensure energy for everyone. This goal supports the definition of sustainable energy created by Tester et al. (2012) expressing the importance of both energy security and efficiency.

2.2. Measuring Sustainability in the Energy Industry

In order to attempt to evaluate the sustainability of the energy industry, it is important to establish the criteria and methods of measurement. An important factor when measuring the sustainability of energy is to look at its entire life cycle, since only the full life cycle can display the accurate level of environmental sustainability (World Energy Council, 2019). This applies to all forms of energy production, including renewable energy since environmental impacts of renewable energy might be significant when the whole cycle is analyzed. The entire life cycle of energy encompasses generation, manufacturing, transportation and waste management (ibid).

Buonocore et al. (2019) makes the claim that the metrics necessary for tracking company activity is currently both limited and primitive. They explain that as of today, it is not possible to link energy company activity to their own contributions towards The United Nations (UN) Sustainable Development Goals (SDGs). Additionally, it is stated that the existence of credible methods to measure and track progress towards the SDGs could promote progress in attaining these particular goals (ibid). Although there might exist a large array of metrics and frameworks for measuring sustainability, most of them are imprecise when implementing to different industries. Suganthi (2020) maintains the assumption made by Buonocore et al. (2019), by stating that there is a significant number of different indicators for sustainable development, albeit deciphering and inferring information out of all the different indicators is cumbersome, since they intermittently appear in different units. The World Energy Council (2019) adds even further to this by stating that a limitation of environmental evaluation of
energy is the lack of global comparable data for all regions. However, according to their report (2019), the EU energy statistics are an adequate example of data that covers most aspects related to environmental energy and somewhat reflects the full life cycle of energy generation and distribution.

A framework set specifically for the energy industry is the EISD (Energy Indicators for Sustainable Development) created by the International Atomic Energy Agency. The 30 different EISD indicators can be used to plan sustainable and long-term energy strategies and monitor progress towards the national energy objectives in any specific country (Vera et al., 2005). The indicator takes into consideration the three-pillar approach of focusing on environmental, social and economic dimensions of sustainable development in the energy industry. However, similar to many indicators, the EISD is correspondingly imprecise and limited when it pertains to implementing it to a business strategy.

A salient indicator for examining the potential benefits to society in the energy industry, is the energy return on investment (EROI) indicator (Mulder & Hagens, 2008). The EROI indicator determines the ratio of energy produced to energy consumed by an energy production technology (ibid). Essentially, the EROI is a tool that displays a comparison of energy revenue against the cost of the energy plant operations where it has been produced.

2.3. Reasons for Lack of Sustainability in the Energy Industry
A study conducted by Galina Alova (2020) revealed that globally, less than half of all electric utilities had prioritized the development of renewable energy over the past 20 years, although being aware of the importance of an energy transition. Additionally, the study revealed that even among the energy utilities that focused on solar and wind sources, just 15 percent reduced commitment to fossil fuels at the same time. This study indicates that although there is awareness of introducing sustainable methods, only a few utilities have acted on it. Thus, there is still a need for incentives and policies globally in the energy industry to commit to an energy transition.

There exist a few reasons as for why most electric utilities have not entirely committed to sustainable energy. The use of fossil fuels is prevalingly efficient, convenient, well-
established, and does not require further innovation, contrary to the use of renewables (Cheek, 2020). Numerous factors prove fossil fuels to be significantly preeminent to renewables when it comes to factors other than the negative environmental impact. Hence, roughly 80% of global energy consumption continues to come from fossil fuels (IEA Statistics, 2014). Moreover, fossil fuels have been the dominant source of energy for the past two centuries. Therefore, shifting to other energy sources would require an abundance of investing and innovation, which most electric utilities are unable to operate without external support. This is additionally stated by Mulder and Hagens (2008), who reported that new energy technologies, such as those concerning renewable energy, require substantial capital investments and significant lead time, as well as extensive research and planning.

Currently, lobbying is one of the main factors preventing a sustainable energy transition. According to the non-profit community interest company InfluenceMap (2020), actors associated with the fossil fuel value chain have been lobbying across Australia, Canada, the United States, and the European Union in attempts to secure both financial support and regulatory rollbacks. This lobbying prevents a transition towards renewables and could have both dire and long-lasting effects on efforts to mitigate climate change.

An argument repeatedly used in the energy industry for the continuous use of fossil fuels is its high energy return on energy investment (EROI), compared to that of renewable energy sources. This argument is usually based on the fact that renewable infrastructure generally requires a large initial investment, which is why renewable energies are considered to have a lower EROI. However, in a study made in 2019 by scientists from the Sustainability Research Institute at the University of Leeds, it was calculated that the renewable-based EROI might be higher than that of fossil fuels’ EROI when measured at the same final energy stage (Brockway et al., 2019). Additionally, it is stated that the increasing energy costs of extracting soon-to-be exhausted fossil fuels will cause the EROI ratio to decline even further (ibid). This finding about the EROI of fossil fuels and renewables should be taken into consideration in the industry when contemplating on new energy infrastructure investments.
2.4. Importance of Introducing Sustainable Methods into the Energy Industry

A failure to mitigate and adapt to the rise of global population and economic growth, with the increase in demand for energy, creates immense pressure towards the industry. The World Energy Assessment by UNDP (2000) stated that the continuing of the current path of energy system development is not compatible with sustainable development objectives. On their website the UNDP (2021) asserts that the energy sector is, by far, the main contributor to climate change, and that it accounts for 73 percent of human-caused greenhouse gases. The Organisation for Economic Co-operation and Development (2016) supports this by stating that the electricity sector has an essential role in achieving decarbonization of the economy.

The assessment made by UNDP (2000) stated that a sustainable future will require more dependency on some combinations of higher energy efficiencies, renewable resources, and advanced energy technologies. The OCED (2016) report supports the assessment made by UNDP emphasizing that the electricity generation needs to shift to low-carbon technologies, by relying on a diverse range of centralized and decentralized technological solutions. Additionally, the OECD report (2016) states that a transition needs to be made from direct fossil-fuel uses towards more electricity efficient alternatives. However, the details of the transition will differ depending on country, based on differences in geography, resources, level of revenues, and existing infrastructure (ibid).

As mentioned by Rosen (2009), energy processes generate numerous environmental impacts, which include:

- acidification (the impact on soil and water of acidic emissions),
- ozone depletion (i.e., destruction of the atmospheric ozone layer and subsequent increases in ultraviolet reaching the earth's surface),
- abiotic resource depletion (due to the extraction of non-renewable raw materials),
- radiological effects (e.g., radiogenic cancer mortality or morbidity due to internal or external radiation exposure),
- ecotoxicity (health problems from exposure to toxic substances), and
- global warming (attributable mainly to greenhouse gas emissions and considered to be a key driver of climate change).

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These impacts of energy processing should be addressed and dealt with accordingly, in order to facilitate achieving environmentally friendly energy sustainability.

2.5. Consumer and Prosumer Contribution to the Energy Industry

During previous decades, consumer expectations have risen, as they have gradually become more aware of global issues. This change has made it more prevalent for companies to prioritize transparency and sustainability in their actions, in order to retain their customers. It is clear that information regarding sustainability is imperative for consumer responses, as it has been seen in the past that poor sustainability orientations and policies alike are heavily damaging when concerning a company’s evaluation (Choi & Ng, 2011). Málovics et al. (2008) suggests that businesses appear to have difficulties in finding solutions for sustainable development themselves, and instead need active participation and cooperation of governments, business, and citizens in order to set it as a goal in the society. Therefore, it could be proposed that if energy utilities were being driven by consumers and the government simultaneously, it might be successful in incentivizing the industry to make a transition towards a more sustainable output (ibid).

Currently, energy consumers are mostly passive users of electricity and the power grid, and therefore have a limited number of possibilities to take action in their behavior or consuming habits, that might have a significant effect in the energy market (Immonen et al., 2020). It is suggested that if energy companies provide their customers with more flexibility and control over their electricity and transmission fees, it will make energy consumers more active and thus an important player in the energy industry (ibid).

The prosumer role in regard to the energy transition is progressively increasing and changing the industry. The European Commission (2020) defines prosumers as people who both produce and consume their own renewable energy. Due to being more active in the energy industry, prosumers will eventually have a more significant impact in the industry than consumers. According to a report shaped by SmartEn (Sawyer, n.d.) prosumers do not only include single actors, but moreover, a wide range of actors such as households, commercial, and industrial players.
2.5.1. Consumer Expectations Regarding the Energy Industry

The European Social Survey revealed that European citizens preferred electricity produced from renewable sources and also public subsidies on the renewable energy sources (Pohjolainen et al., 2018). These results would indicate that public perceptions would not obstruct a sustainable energy transition in Europe, but rather encourage one. An analysis done by the Natural Marketing Institute (2011) in the United States supports the same findings that were found from the European Social Survey. The Natural Marketing Institute analysis revealed that the majority of American consumers, being 80 percent, cared about the use of renewable energy and primarily associated renewable energy with environmental benefits. However, the analysis deduced that the consumer awareness of renewable energy purchase options abides relatively low and proposes a challenge for utilities and companies who provide renewable energy options for their customers.

Although consumer expectations could prove to drive forward a more sustainable energy industry, it is still important to address that consumer knowledge is still largely insufficient when it comes to practicalities in the energy industry. According to Bang et al. (2000) consumers are exceedingly concerned about the environment and have high regard about the efficacy of green products, however they are not especially knowledgeable about specific environmentally friendly alternatives, such as renewable energy. Educational processes, especially in higher education, have a pivotal role in regard to shifting development to be more sustainable (Krajnc et al., 2008). Dincer (2000) introduces a few essential factors for sustainable development. Some factors that were mentioned, that also regarded consumer knowledge, were public awareness, informational input on energy utilization, environmental impacts, and renewable energy resources, and environmental education and training. In the long run, these factors will have a crucial role in consumer impact and continuing sustainable development in the energy industry even further.

2.5.2. Prosumer role in the Energy Transition

The sustainable development of the energy systems could largely be driven by prosumers, who are emerging as new actors in the energy system, with the help of affordable renewable technologies and smart energy meters (Kotilainen, 2020). This
statement made by Kotilainen (2020) is supported by the European Commission (2020) by mentioning that prosumers are challenging the existing energy market structures and institutions, since they incite an energy system that is more decentralized and inclusive. The report by SmartEn (Sawyer, n.d.) includes a sufficient number of positive attributes that prosumers bring to the energy system. The SmartEn report mentions that prosumers have an “important role in decarbonization, keeping overall system costs low, as well as increasing energy security and resilience”. In addition, prosumers have an important role in making the energy system inclusive, raising overall awareness, increasing competition, and innovation (ibid). Due to this leverage that prosumers bring into the energy industry, it is important for companies and governments to acknowledge prosumers in their actions and policy making.

The multi-level perspective on sustainability transition framework (Geels & Schot, 2007; Geels, 2011) is an adequate approach to examine socio-technical transitions. The framework (2007;2011) includes three analytical levels: niche-innovations, socio-technical regimes, and socio-technical landscapes. The multi-level perspective framework can be used to perceive the pressure that prosumer actions and consumer expectations can have on the energy industry and the landscape it operates in. In this context, prosumers work as the technological niches who help create a variety of early innovations that could conceivably move towards a more dominant design in the socio-technological regime, being the energy industry. Through this transitional progress, the energy industry will have a positive environmental effect on the evolution of the landscape it operates in.

2.6. An Outlook on the Sustainable Energy Transition
A completely renewable global energy system can be possible. According to Deng et al. (2012), a 95 percent sustainably sourced energy supply can be reached by 2050. This could solely be achieved by combining increased energy efficiency on the demand side with a stimulated and renewable energy supply from all available sources in a certain proximity (ibid). However, this goal is, more or less, unattainable considering that it demands a strict paradigm shift that favors long-term integrated strategies which have yet to be extensively initiated. As IRENA (2019) asserts, the current national plans around the world are not enough to reduce emissions required to reach either the goal articulated in the Paris Agreement concerning climate change or the 1.5-
degree Celsius IPCC recommendation. With the intention of pursuing these goals, IRENA (2019) suggests that a significant number of investments are needed towards an energy transition, including investments in renewable power generation, energy storage, extension and reinforcement of transmission and distribution networks, electrification, and efficiency in end-use sectors.

Although renewable energy sources should increase in use, so as to achieve a more sustainable energy transition, the limits of their use should be taken into consideration. Gutierrez (2009) premeditates that renewable resources could become non-renewable, provided that the rate of utilization would exceed the capacity of the planet to recycle the replenished materials. An excessive consumption of these renewable resources could lead to limits in the availability of them, and the consumption would become unsustainable (ibid). Therefore, these limits should be taken into consideration when utilizing renewable energy sources.

In their article, Schillebeeckx et al. (2020) studied the increase in sustainable business practices. The study revealed that while input switching decisions that are more environmentally friendly exist, there is still a prevailing reluctance to switch to these options due to the main structures that individuals in managerial positions oversee. In many cases, cognitive inertia, the tendency to resist change, affects managers, and thus they may choose to stick to their traditional methods rather than approach new ones (ibid). Consequently, this phenomenon could affect the energy industry robustly enough to abate a transition in the industry. Different methods of alleviating cognitive inertia, in regard to environmental decisions, would be imperative.

### 2.6.1. Energy Sources

Contrary to fossil fuel sources, renewable energy sources restore themselves naturally without being exhausted. Renewable energy sources include bioenergy, hydropower, geothermal energy, solar energy, wind energy, and ocean energy which incorporates tide and wave energy (Owusu & Asumadu-Sarkodie, 2016).

Table 1 created by Popovski and Vasilevska (2008) compares energy sources against each other and gives an adequate perception of the different energy sources that can be used for power generation. An initial general conclusion that was made from Table...
1 is that each one of the renewable energy sources has some significant advantage or advantages when compared with fossil fuels. However, the advantages of fossil fuels are prevailing, especially if the proven negative impact on the environment is neglected (ibid).

Table 1: Some General Comparisons Between Energy Sources (Popovski & Vasilevska, 2008)

<table>
<thead>
<tr>
<th>Availability</th>
<th>Geo-thermal</th>
<th>Hydro</th>
<th>Solar</th>
<th>Wind</th>
<th>Bio-mass</th>
<th>Urban waste</th>
<th>Fossil fuels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>In concrete locations (except for heat pumps)</td>
<td>In concrete locations</td>
<td>Depending on geographical location</td>
<td>Depending on bioclimatic conditions</td>
<td>Depending on bioclimatic conditions</td>
<td>Depending only on economic strength of the site</td>
<td></td>
</tr>
<tr>
<td>Production costs</td>
<td>Moderate, depends on annual loading factor</td>
<td>Low, only maintenance costs</td>
<td>Low, only maintenance costs</td>
<td>Moderate</td>
<td>High, depends on costs of environmental protection</td>
<td>Low, depends on the fuel in question</td>
<td></td>
</tr>
<tr>
<td>Maintenance cost</td>
<td>Complicated, depends on the source characteristics</td>
<td>Simple but needs regular maintenance</td>
<td>Simple and cost-effective</td>
<td>Simple but work intensive and continual modification</td>
<td>Complicated and expensive, needs special organization</td>
<td>Depends on fuel in question, already very much developed practice</td>
<td></td>
</tr>
</tbody>
</table>

2.6.2. Energy End-Use

There seems to exist a general consensus that renewable energy sources are the solution to a sustainable energy generation. Dincer (2000) shares this thought by stating that reasonable alternatives to conventional energy generation would be the development of advanced renewable energy technologies, since they could serve as more cost-effective and environmentally responsible. Additionally, he states that a technical and market potential prevails to significantly increase the current contribution of renewable energy sources to the energy demand. However, Owusu and Asumadu-Sarkodie (2016) contradict this by expressing that barriers such as cost, price, political environment and market conditions prevent developing in this area, in developed and undeveloped countries. They suggest that these barriers can be eliminated through international cooperation that encourages all countries towards the accessibility of renewable energy, energy efficiency, clean energy technology, and research and energy infrastructure investment.
The end-use of energy essentially defines the demand for the whole industry and is thus important to take into consideration, although, it might not have any direct impact on the environment intrinsically. Primarily, energy is used by industrial, household, and commercial energy consumers at the end of its cycle, and these stakeholders are indirectly responsible for overall energy sustainability (World Energy Council, 2019). Furthermore, they can make a positive impact by increasing energy efficiency and reducing unnecessary use of energy, or by choosing to utilize renewable energy in their use (ibid). According to the World Energy Assessment compiled by The United Nations Development Programme (Jochem et al., 2000) one of the main technological drivers of sustainable development globally is energy efficient end-use. Additionally, it is stated that energy policies traditionally underestimate the benefits of end-use efficiency in factors such as the society, environment, and employment.

2.7. Conclusion
An immediate paradigm shift is needed in the energy industry to reach national goals of reduced emissions. This energy transition requires the attention of not only the energy sector, but also the government and consumers. In addition, an increase in general information, knowledge, incentives, and policies could further assert pressure on the industry to reach towards a sustainable energy transition.

The goal of environmental sustainability in the energy sector is to ‘improve energy accessibility and affordability while reducing environmental harm’ (The World Energy Council, 2019). To achieve this goal, a significant amount of further innovation, including, but not limited to, new technologies, market designs and business models are still urgently needed.

2.8. Conceptual Framework
The conceptual framework displayed in Figure 1 aims to visualize concepts and provide a basis for empirical analysis, based on the review of literature that underlined the basis of the study.
The center of interest of this study is on the implications of a sustainable energy transition. According to the literature reviewed, this transition requires an increase in general information and knowledge, incentives and policies, and innovation and new technology to catalyze the change. When these factors increase, regarding the energy industry, it will incite consumer and prosumer action and encourage energy companies to provide more sustainable options. In addition, the increase in consumer and prosumer action will motivate energy companies to provide their customers with sustainable options to fill in the demand. This works the other way around as well, since when energy companies provide more sustainable options for their customers it will increase their actions towards choosing sustainable options or even motivate consumers to turn into prosumers. This study will focus on the consumer expectations and prosumer actions regarding the energy industry and how crucial it is for encouraging an energy transition, since the literature reviewed confirms the particular aspect to be the least researched.

The goal of this study is to analyze the factors affecting the transition towards sustainable energy systems. Moreover, the study aims to encourage a sustainable energy transition, not only in the industry, but furthermore amid the consumers. As the conceptual framework in Figure 1 and the review of the literature reveal, a sustainable energy transition requires action from the government, educational systems, researchers and industry specialists, energy companies, and energy consumers.

3. METHODOLOGY
The methodology of this thesis will be compiled by primary research based on the secondary research provided in the literature review. For the primary research both a quantitative and a qualitative study method was chosen, in order to properly address the three research questions and objectives of this thesis. In addition to the quantitative study method applied to consumer expectations and prosumer actions, a qualitative study method was chosen to support and provide more in-depth answers to the research questions about the energy company preparedness to respond to consumer expectations.

This section will begin by covering the purpose of the quantitative study and then its method and design, which will explain how the survey was constructed and designed. After that, the sampling and data collection will be explained to provide insight on how the responses were collected for the survey. The second part of this section covers the methodology for the qualitative study, and its sampling and means of data analysis.

3.1. Quantitative Research

The quantitative study method was chosen to answer RQ2 and fulfill RO2 related to consumer perceptions and actions. In order to reach these goals, a survey was deemed the most effective method of data collection on consumer perceptions and actions related to sustainable energy, since quantitative methodologies are usually used to measure consumer behavior, knowledge, opinions, or attitudes (Cooper, 2014). An online survey was chosen for the quantitative research as it is considered the most convenient way of collecting a sufficient amount of data to describe samples and populations (Watson et al., 2008). The full survey is presented in Appendix 1.

3.1.1. Method and Design

The survey was constructed in an online survey software called Webropol. The survey was conducted anonymously and was voluntary for all participants. The survey had 27 mandatory questions of varying type. The survey was designed to figure out consumer knowledge, values, and actions related to sustainable energy, and was sectioned respectively. At the end of the survey some background (e.g., concerning demographics) questions were included. In total the survey consisted of 5 sections and 9 pages in order to not appear too laborious to the respondents. Before publication,
the survey was reviewed by one person and tested out on another person to make sure all questions were correctly written and easy to understand.

The first section included page one and two of the survey. Page one included the foreword and set out general information of the survey and its purpose. The foreword included two requisites for the participant to be able to start answering the survey. Purpose of the requisites was to provide a more correct sample size and is discussed further in section 3.1.2 of this thesis. The second page of the survey included questions to make sure respondents filled the requisites proposed in the foreword of the survey.

The second section included page three and asked the participant to rate their own knowledge regarding aspects of the energy sector. Additionally, it was asked if they wanted to and were willing to expand their knowledge of the energy sector further and an open-ended question of where they had gained their current knowledge from.

The third section included page four, five and six, and consisted of questions to find out the values of the respondents when it came to sustainability and energy. The fifth page included a previously published measurement scale. The measurement scale used was the Sustainability-focused value orientation (SVAL) scale to measure how sustainability-focused value orientation affects societal and personal consumer behavior regarding energy sector related opinions and actions (Buerke et al., 2016). The SVAL measurement scale measures a respondent’s sustainability in all three dimensions: environmental, social and economic (ibid).

The fourth section included page seven and eight, and asked respondents of their actual actions and behavior. Page seven consisted of questions about energy consumption and end-use. Page eight consisted of questions relating to participants options or willingness to take action and consequently if they had taken any actual actions.

The fifth section included page nine and asked three demographic questions to figure out the demographics of the sample size. Questions related to respondents’ gender, age and nationality were asked.
3.1.2. Sampling and Data Collection
A convenience sampling method and a snowball sampling method was used to get respondents for the survey. The convenience sampling method was chosen due to accessibility, time constraints, and in order to increase the sample size for the survey. The purpose of the study required a sample of the general public and therefore, convenience sampling was deemed as the best sampling method. Additionally, the snowball sampling method was used to get respondents with more insight to the thesis topic and to gain more diverse answers for the sample size. The respondents were sought out through personal connections and by posting the link to the survey on social media platforms, such as Facebook, LinkedIn and Instagram. Additionally, the survey was shared to all current students at Aalto University Business School, Mikkeli campus through the academic email. The survey was open for 10 days during which 85 people in total answered the survey, which was also the final sample size used in the data analysis.

The data sampling and collection was limited to only allow participants who have had to manage their own electric contract and have completed upper secondary level education. This was done in order to get realistic consumer perceptions and behavior of people who have had to manage their own electric contract. Upper secondary level education was chosen, since in Finland this is the obligatory level of education, and in order to see how participants knowledge differ or does not differ on the same educational basis.

3.2. Qualitative Research
The qualitative study method was chosen to answer RQ3 and fulfill RO3. To answer the research question and to achieve the objective an interview was held with an industry expert and employee in a European energy company. Qualitative methodology is usually used to achieve an in-depth understanding of a situation (Cooper, 2014). Thus, it was deemed the most effective way to get an insight of how energy companies respond to consumer expectations and prosumer actions. By figuring that out, it is possible to get a more comprehensive understanding of how consumers and prosumers contribute to the energy industry. Additionally, the qualitative interview method was chosen as it gives a more adequate contribution to
understanding a specific situation (Weiss, 1995). All the interview questions are presented in Appendix 2.

3.2.1. Method and Design
A semi-structured interview method was chosen to allow the interviewee to prepare for questions and therefore being able to provide more in-depth answers for each question. In addition, a semi-structured interview method allowed the interviewee to bring up new ideas and concepts.

The wording of the interview questions was open-ended, to allow for more detailed discussion on the research topic. The interview started with a brief introduction to the thesis topic, so that the interviewee could understand the purpose of the interview and could give more insight related to the thesis topic. Then the interviewee was presented some general questions related to their career in the energy sector. The main questions in the interview were divided into four categories: the energy process, company values, sustainability, and consumer behavior. Additionally, at the end of the interview, it was asked if the interviewee had anything to add to the discussion. The interview included 15 questions in total (Appendix 2).

3.2.2. Sampling Design
The research participant was chosen by purposive sampling, since they were chosen for their specific experience and knowledge in an energy company (Cooper, 2014). Vattenfall was chosen as the case company for the company’s significant strides towards sustainability and fossil free living. From this specific case company one participant was chosen based on their knowledge related to the company’s strategy on sustainability from a consumer perspective.

Vattenfall is a European energy company, who produces and retails electricity and heat mainly through solar, hydro, nuclear and wind power plants. Vattenfall is owned by the Swedish state but serves customers widely in Europe. Vattenfall is one of the leading companies in renewable energy production and have a clear goal of enabling fossil free living within one generation (Vattenfall, n.d.).
Vattenfall was chosen as the case company, since it operates on a large scale and has taken sustainability measures widely into account in their actions. When contacting the Head of Sustainability from Vattenfall, Lars Ejeklint was suggested for the interview due to the consumer focus of the study. Thus, the qualitative interview was done with Lars Ejeklint, who works as a climate coach and energy expert in the sales organization of Vattenfall. Lars Ejeklint works together with private customers and business to business customers, to help them reach their ambition to live a fossil free life. Table 2. provides information regarding the interview and the interviewee. The interview was conducted in English, since that was the common language for both the interviewer and the interviewee.

<table>
<thead>
<tr>
<th>Interview date</th>
<th>Interview method</th>
<th>Participant</th>
<th>Case company</th>
<th>Job title</th>
<th>Years in the company</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.3.2021</td>
<td>Zoom</td>
<td>Lars Ejeklint</td>
<td>Vattenfall</td>
<td>Climate Coach and Energy Expert</td>
<td>44 years</td>
</tr>
</tbody>
</table>

Table 2. Interviewee profile

3.2.3. Data Analysis

The data analysis of the qualitative data in the interview was done through an inductive approach. The inductive approach for data analysis was chosen in order to be able to establish clear links between the research objectives from the qualitative data. The inductive approach provides a straightforward and systematic set of procedures for analyzing qualitative data that can produce reliable and valid findings (Thomas, 2006). With the use of an inductive approach themes or categories most relevant to research objectives are identified from the qualitative data (ibid).

The analysis of the qualitative data was done by writing out a transcript of the interview. The transcript was 6 pages long and was read through five times during the analysis process. The transcript was read through with inductive reasoning i.e., to find out emerging themes from the raw data. The data was first read through to acknowledge and differentiate the company’s opinions and actions stated by the interviewee. Two main themes were recognized from the interview data: opinions and actions related to customers and opinions and actions related to sustainability. These themes were expected due to the nature of the interview questions presented.
4. FINDINGS

4.1. Quantitative Data

As previously explained in the methodology section, the quantitative research was done through an online survey. Findings from the survey will be shown in the following sections. The analysis of the quantitative data was done on SPSS and Excel.

4.1.1. Demographics

The survey had 85 respondents within the sample requirements, with no respondents being excluded from the data analysis. The ages of respondents ranged from 19 to 75 years, the median being 22 years and mean equaling 28.75 years (Figure 2). Out of the 85 respondents, 52.9% were male (N=45), 44.7% were women (N=38), 1.2% were other (N=1), and 1.2% preferred not to say (N=1) (Figure 3).

The majority (86%, N=73) of respondents were Finnish, which was expected as this survey was conducted in a Finnish University. However, a total of 12 nationalities were recorded among participants (Table 3). All participants were required to have completed upper secondary education. Among the respondents 74.12% (N=64) had a bachelor level education or higher (Figure 4).

<table>
<thead>
<tr>
<th>Nationality</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finnish</td>
<td>73</td>
</tr>
<tr>
<td>Indian</td>
<td>2</td>
</tr>
<tr>
<td>American</td>
<td>1</td>
</tr>
<tr>
<td>Austrian</td>
<td>1</td>
</tr>
<tr>
<td>Belgian</td>
<td>1</td>
</tr>
<tr>
<td>British</td>
<td>1</td>
</tr>
<tr>
<td>French</td>
<td>1</td>
</tr>
<tr>
<td>German</td>
<td>1</td>
</tr>
<tr>
<td>Irish</td>
<td>1</td>
</tr>
<tr>
<td>Norwegian</td>
<td>1</td>
</tr>
<tr>
<td>Polish</td>
<td>1</td>
</tr>
<tr>
<td>Russian</td>
<td>1</td>
</tr>
</tbody>
</table>

*Table 3. Nationalities of the respondents*
Figure 2. A bar chart of the age of respondents

Figure 3. A pie chart of the gender of respondents
4.1.2. Consumer Knowledge

In the survey participants were asked to rate their knowledge of the energy sector. A subscale was made of all the three questions asking the participant to rate their knowledge. The scale was named “Knowledge” and consisted of three items with a Cronbach’s alpha of .872. The knowledge scale had a mean of 5.467 on a scale of 1-10, 1 representing no knowledge and 10 representing expert knowledge (Figure 5).

When the respondents were asked to rate their general knowledge of the energy sector the mean was 4.600 among participants. However, the most knowledge was rated on knowledge of the environmental impact created by the energy sector, which was the highest with a mean of 5.918 (Figure 6).

<table>
<thead>
<tr>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Mode</td>
</tr>
<tr>
<td>Std. Deviation</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
</tbody>
</table>

Figure 5. Energy sector knowledge subscale statistics
Educational level had no significant difference (p>0.05) on the level of knowledge rated in each factor. This would indicate that participants have not largely gained their current knowledge of the energy sector from their education. However, as expected, participants 30 years of age or higher reported a significant (p<0.05) amount of higher knowledge than participants under 30 years of age (Figure 7). The mean of knowledge for ages of 19-29 being 5.12 and the mean of knowledge for ages of 30-75 being 6.50. This would indicate that as age increases the knowledge of the energy sector would also increase.

Figure 6. The three items on the energy sector knowledge subscale and their statistics

![Table with statistics]

An open-ended question was presented asking where the participants had gained their current knowledge of the energy sector from. After reading through the open-ended questions, it seemed like most participants had gained their knowledge from the
internet through news, social media, websites, and articles. Other factors which were mentioned were education and personal connections.

Most participants (96.47%, N=83) wanted to expand their knowledge of the energy sector. However, 38.65% (N=32) of all participants wanted to expand their knowledge but were not bothered to take any action of their own. This would indicate that if energy companies provide their customers with information about the energy sector, it would be of interest to them.

![Pie chart](image)

![Figure 8. A pie chart of willingness to expand knowledge of the energy sector](image)

When asking participants their option to buy renewable energy from their electric/utility company, 24.71% of participants did not know of their options (Figure 9). Additionally, when asking of their option to buy renewable power from someone other than their current electric/utility company, 21.18% of participants did not know of such options (Figure 10). This indicates that electric/utility companies who provide renewable energy have room to increase their marketing attempts related to renewable energy options.
When it came to cares and worries that consumers have related to the energy industry, the most strongly addressed ones were related to the environment, over other factors such as energy security and price. When it came to cares 64.7% (N=55) of all participants strongly agreed to the statement “I care about protecting the environment” and when it came to worries the most agreed statement was “I am worried about climate change” with 56.47% (N=48) of participants strongly agreeing to it on a 5-point Likert scale. In addition, there was a significant difference (p<.05) of people under 22
years of age demonstrating more care about protecting the environment and more worry about climate change than people 22 years of age and over (Figure 13).

**Figure 11.** A pie chart of the answers to the statement "I care about protecting the environment"

**Figure 12.** A pie chart of the answers to the statement "I am worried about climate change"
Figure 13. Age groups 1: 19-21 and 2: 22-75 amount of worry and care compared to specific statements

The sustainability-focused value orientation (SVAL) measurement scale consisted of nine items (Table 4). A subscale was created by averaging those nine items to create the sustainability-focused value orientation (SVAL) subscale ($\alpha = .851$). One sample T test was made to compare the means of the SVAL gotten from this data (5.92) to the original published article (5.64). The one sample T test proved that the mean value of 5.92 gotten from this data was significantly ($p<.05$) higher than the 5.64 in the original article (Figure 14).

<table>
<thead>
<tr>
<th>Sustainability-focused value orientation (SVAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimension</strong></td>
</tr>
<tr>
<td>Environmental</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Social</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Economic</td>
</tr>
</tbody>
</table>
It really bothers me if I find out that a company treats its employees unfairly.

I think that firms have a responsibility to treat their customers always in a fair way.

Table 4. SVAL measurement scale items (Buerke et al., 2016)

<table>
<thead>
<tr>
<th>SVAL</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error of Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>85</td>
<td>5.9229</td>
<td>.77342</td>
<td>.08389</td>
</tr>
</tbody>
</table>

Figure 14. One-sample t test comparing the SVAL measurement scale mean to the previously published one.

According to the data found in the survey there was a significance (p<.05) when age increased, the SVAL value increased as well (Figure 15). This would indicate that the sustainability-focused value orientation generally increases with age. However, there was no significant difference (p>.05) in the answers on the SVAL scale when it came to educational level (Figure 16). This indicates that sustainability-focused value orientation does not generally depend on educational level.

Figure 15. Correlation with SVAL and age of respondent.

<table>
<thead>
<tr>
<th>Correlations</th>
<th>What is your age?</th>
<th>SVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is your age?</td>
<td>Pearson Correlation</td>
<td>.247*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.025</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>85</td>
</tr>
<tr>
<td>SVAL</td>
<td>Pearson Correlation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.025</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>85</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
Figure 16. One-way ANOVA with SVAL and educational level of respondent

It was found that possible climate policy measures are widely supported by well over half of the respondents: 78.83% (N=67) of respondents were either somewhat or strongly in favor of increasing taxes on fossil fuels and 88.24% (N=75) of respondents were either somewhat or strongly in favor of using public money to subsidize renewable energy (Figure 17).

Figure 17. A bar chart of respondents support for climate policy measures

The respondents were asked to rate different factors and their importance when choosing an energy provider. The respondents were also asked to rank different factors affecting their decision to switch energy provider. When it came to choosing energy provider the most important factors were reliability, price, and contract terms respectively (Figure 18). When it came to factors affecting switching behavior the most
important factors were price, sustainability, and reliability respectively (Figure 19). In both cases customer service was deemed the least important or ranked the lowest.

Figure 18. Importance of factors when choosing energy provider

Figure 19. Factors affecting the decision to switch energy provider

4.1.4. Consumer Actions

A subscale was created by the actions consumers reported taking related to energy consumption. This subscale had seven items and was named “EnergyActions”. The seven items included were:

1. I turn off unnecessary lights
2. I unplug unused electronics
3. I use energy efficient lighting
4. I use energy efficient appliances
5. I wash only full loads of dishes and clothes
6. I do not use unnecessary heating
7. Other, please specify:
   7.1 Use wood to heat
   7.2 I buy electricity produced by a nuclear plant
   7.3 Avoid red meat for the most part
   7.4 I avoid using unnecessary appliances
   7.5 Drive less
   7.6 Use public transportation
   7.7 I turn off unused electronics
   7.8 Short showers
   7.9 Reduce energy losses
   7.10 Avoid flying

When comparing the EnergyActions subscale with the question “How often do you take action to reduce your overall energy use?” there was a significant correlation (p<.01) (Figure 20). This would indicate that respondents answered realistically about their own actions related to energy consumption.

<table>
<thead>
<tr>
<th>Correlations</th>
<th>EnergyActions</th>
<th>How often do you take action to reduce your overall energy use?</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnergyActions Pearson Correlation</td>
<td>1</td>
<td>.413**</td>
</tr>
<tr>
<td>Sig (2-tailed)</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>How often do you take action to reduce your overall energy use?</td>
<td>Pearson Correlation</td>
<td>.413**</td>
</tr>
<tr>
<td>Sig (2-tailed)</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>85</td>
<td>85</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed).

Figure 20. Correlation between the EnergyActions subscale and specific statement

A subscale was created on the willingness to turn into a prosumer, which was named “Prosumer”. This subscale included three items with a Cronbach’s alfa of .728.

The three statements used in the Prosumer subscale were:

1. I want to be more self-sufficient when it comes to electricity
2. I want to have more agency when it comes to my electricity supply
3. I want to be able to produce my own energy
The correlation between the Prosumer and SVAL subscale was significant ($p<.01$), which indicates that the willingness to take prosumer actions correlated with sustainability-focused value orientation (Figure 21). This supports the statement that SVAL has a significant positive relationship with societal and personal responsible consumer behavior (Buerke et al., 2016). Additionally, a significance ($p<.01$) was found which indicated that the more likely a participant was to think that producing their own energy would reduce climate change the higher their prosumer subscale value would be (Figure 22). This means that if a person believes they can help reduce climate through producing their own energy they are more willing to be more self-sufficient, have more agency and produce their own energy than those who do not.

![Figure 21. Correlation between Prosumer subscale and SVAL subscale](image1.png)

<table>
<thead>
<tr>
<th>Prosumer</th>
<th>Pearson Correlation</th>
<th>Sig (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prosumer</td>
<td>1</td>
<td>.335**</td>
<td>85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SVAL</th>
<th>Pearson Correlation</th>
<th>Sig (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVAL</td>
<td>.335**</td>
<td>.002</td>
<td>85</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).**

![Figure 22. Correlation between Prosumer subscale and specific statement](image2.png)

<table>
<thead>
<tr>
<th>Prosumer</th>
<th>Pearson Correlation</th>
<th>Sig (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prosumer</td>
<td>1</td>
<td>.404**</td>
<td>85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How likely do you think that producing your own energy would help reduce climate change?</th>
<th>Pearson Correlation</th>
<th>Sig (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>How likely do you think that producing your own energy would help reduce climate change?</td>
<td>.404**</td>
<td>.000</td>
<td>85</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).**

A question of interest was if people would switch energy provider if the company was exposed for unsustainable production methods, and what factors predict switching behavior in a sustainability context. However, because only 4 people said they would...
not switch if a company was exposed for unsustainable production methods, the “No” category could not be analyzed. Therefore, the relationship between both the “Yes” and the “I would consider switching to another company” categories were observed in the analysis. Considering that 95.29% (N=81) of respondents would switch or would consider switching is already of significant interest for companies to take into consideration when making decisions regarding their sustainability in their energy process.

Figure 23. A bar chart of respondents’ answers on if they would switch energy provider in a specific situation

When comparing the SVAL subscale against the decision of a participant to answer “Yes” or “I would consider switching to another company” in an independent samples t test, those who answered yes had a significantly (p<.05) higher SVAL than those who would only consider (Figure 24). This indicates that the sustainability-focused value orientation has a significant effect on switching energy provider decisions in sustainability related situations.
When comparing the answers of the respondents’ relating to their options and behavior in specific statements, it was found that if a participant did not know about their options, their behavior was usually passive. For example, when it came to buying renewable energy from their current electric/utility company or from somewhere else, most people who did not know of their options did not buy renewable power. From Figure 25 and Figure 26, it can be seen that most people prefer buying their renewable power from their current electric/utility company over buying from other providers. 62.5% (N=35/56) of the respondents who had the option of buying renewable energy from their current electricity/utility company bought renewable energy from their current electricity/utility company. This means that if electric/utility companies provide renewable energy and give their customers information about their options, the customers will most likely consider buying renewable energy.

Figure 24. Independent samples t test between SVAL subscale and if respondent would switch energy provider in a specific situation

<table>
<thead>
<tr>
<th>Group Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent Samples Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levene’s Test for Equality of Variances</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>Equal variances assumed</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
</tr>
<tr>
<td>Independent Samples Test</td>
</tr>
<tr>
<td>t</td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>Equal variances assumed</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
</tr>
</tbody>
</table>
4.2. Qualitative Data

As previously explained in the methodology section, the qualitative research was done through an interview format. Findings from the interview will be shown in the following sections. The purpose of the qualitative data was to find out the opportunities that energy companies have in an energy transition and in the rise of environmentally aware consumers and prosumers. The information in the qualitative findings section is extracted from the interview with Lars Ejeklint.

4.2.1. Case Company’s Perceptions and Actions towards a Sustainable Energy Transition

The findings section of the case company’s perceptions and actions towards a sustainable energy transition has been divided into two parts. Firstly, from the
qualitative data the perceptions and actions that the case company Vattenfall addressed towards sustainability will be explicated. After that the perceptions and actions Vattenfall has addressed towards the change in consumer preferences will be explicated. Both sections will include more general suggestions for the industry.

4.2.1.1. Sustainability

The case company in question expressed a strong will to contribute to sustainable development and a sustainable energy transition. Vattenfall has a clear goal which is addressed on their website and came up during the interview with Lars Ejeklint. “The goal is to in one generation make it possible to live a fossil free life.” However, when Vattenfall started out their business in 1909 they did not know how to proceed with this goal, but they wanted to have a completely fossil free life possible for their customers in 25-30 years. It is apparent that Vattenfall had set clear objectives to reach their goal of fossil free living. Ejeklint mentions in the interview that it is very important that the goals which are set, are ambitious. He adds that it is important these goals are evident for everyone in the company and that the leadership follows up with the goals to make sure the goals are reached. When all the members of the company are aware of the goals set, it is easier for the goal to be reached on all organizational levels.

When working for a sustainable change in an industry that lacks in technological development for sustainable solutions, it is dire to work together in the industry for possible solutions. Lars Ejeklint mentioned in the interview that sometimes the solutions for a problem do not exist in the market. He emphasizes that when that is the case, it is important to work together with research and development, the whole company, and customers when making new solutions. Another important factor Ejeklint mentions in the interview a couple of times is the importance of partnerships, both with other companies and customers.

One of the 6 United Nations Sustainable Development Goals Vattenfall has identified in their strategy is the SDG 17: Partnerships for the goals (Vattenfall, 2019). In the interview Ejeklint mentions several partnerships they have done in the past or that are currently in motion. The main goal of most of the partnerships mentioned is enabling fossil free solutions. Ejeklint mentions that Vattenfall has different partnerships with private customers, B2B customers, and with society to reach their goals. He
emphasizes that partnerships are valuable since they “combine different kinds of facts and different kinds of knowledge, and therefore provides larger amounts of possibilities to reach a goal”.

Ejeklint mentions in the interview that sustainability decisions take a long time to achieve in the energy industry. He provides an example of making the decision to build a wind power unit, and how it can take 10 years from that decision until it can be had on site. However, these decisions are important if a company wants to deliver sustainable energy for their customers. Ejeklint states that a company that strives to be fossil free has to strive for it in all aspects of the production. He emphasizes that a company has to ensure that its suppliers use fossil free energy when producing products for the company, and that the supplier makes sure they reduce their carbon dioxide footprint in all of their processes. If this is ensured, the company can announce to its customers that they have done everything they can to reduce their own and their supplier’s footprint.

When talking about sustainability Ejeklint clarifies that when a company takes action towards sustainability it is very important to follow all the three dimensions of sustainability: environmental, social, and economic. He states that if a company does not follow all those three dimensions of sustainability the company cannot survive in the long run.

### 4.2.1.2. Customers

During the interview it became apparent that the case company values their customers highly and go out of their way to figure out what their customers value. Ejeklint stated that it can be seen that “it is more and more important for the customer that we [Vattenfall] have fossil free products for them.” Vattenfall has conducted surveys in order to figure out their customers concerns and worries. From those surveys it became evident that customers are most worried about the state of the climate and its change. Ejeklint proclaims that if these concerns are not taken into consideration a company will not survive. When taking these customer concerns into consideration it is not only a way to survive as a company but moreover a way to take care of the planet.
When discussing the relationship between profit, customers and sustainability, Ejeklint says that if a company succeeds with sustainability then it will also succeed with the customers, and if customers are satisfied with a company’s products it will generate profit for the company. According to Ejeklint the customer was not so interested in sustainability 10-15 years ago, but that now its rise and increase can be seen every year. He mentions that “it is more and more important for the customers, B2B customers and private customers that the environmental situation will be better”. Additionally, Ejeklint says that Vattenfall has to work hard to reach their customers on sustainability issues but believes that the younger generation will help them reach their goals since they will have the same goals regarding sustainability and fossil free living.

Lars Ejeklint says that Vattenfall has for a couple decades tried to increase customer knowledge about energy and energy consumption. The company started out by giving advice on how customers can reduce energy consumption, but now also provide more information on how customers can use their energy more efficiently. Vattenfall’s goal is to increase the knowledge in their customer base so they can make the right decision by themselves. When talking about prosumers Ejeklint states that Vattenfall believes that the rise of prosumers is a definite opportunity for the company. Vattenfall offers heat pumps and solar PVs to their customers who want to produce their own energy. Vattenfall offers these solutions since the company believes that if they can help their customers fulfill their goals, then the customers will consider Vattenfall a good partner and will continue to buy electricity from them. Additionally, to the heat pumps and solar PVs, Vattenfall offers advice to their customers regarding energy consumption reduction. Although, a company might not offer specific products that customers want in order to reduce their energy consumption it is important for the company to let the customer know of their options so as to build a loyal customer base.

5. DISCUSSION AND ANALYSIS

This section focuses on creating discussion and analysis between the primary and secondary data. Findings from the survey and the interview will be compared with the compiled data from the literature review. In this study, the following research objectives are addressed:
RO1. To identify the different factors affecting the transition towards sustainable energy systems

RO2. To analyze consumer knowledge, values and actions related to sustainability and energy.

RO3. To analyze how the energy sector can take sustainability and consumers into consideration in their actions.

5.1. Current Consumer Perceptions and Industry Implications

Through this study it was found that consumer expectations and actions, together with prosumer actions, are an important aspect in driving the change to a sustainable energy transition. However, to encourage consumer and prosumer action in the energy industry, an increase in knowledge, policies, and technology innovation is needed. Not only will these factors increase consumer and prosumer action, but it will further increase measures taken by energy companies to provide sustainable options for their customers. An increase in sustainable options for energy customers will, in turn, encourage further action taken by consumers and prosumers. However, based on the findings from the survey, it was revealed that a relatively low knowledge among energy customers on their renewable options prevails. This finding is supported by the survey made by the Natural Marketing Institute (2011) which found out that consumer awareness of their renewable energy purchase options remains relatively low. Therefore, energy utilities and companies should provide their customers with more comprehensive knowledge of the renewable options they offer, since it increases their competitive edge in the renewable market. This is supported by the finding in the survey conducted for this thesis, since it revealed that energy customers will most likely consider buying renewable energy if they are aware of such options.

Based on the secondary and primary research, consumer knowledge of the energy sector remains relatively low. It was found out from the survey that there exists an interest among consumers to expand their knowledge of the energy sector and its aspects, however it can be perceived as tedious among consumers to look for the information on their own initiative. Companies should more largely provide their customers with information, both on the energy industry in general and of their options they provide for the customers, since there seems to exist an interest towards knowing more of the energy sector and its aspects. This was done by the case company
interviewed, who believed it was the right way to retain loyal customers. As found out from the survey conducted, energy consumers who are more aware of their options to be sustainable in their energy use will most likely take action towards that. This finding is supported by Choi and Ng (2011) who proclaimed that information regarding sustainability is imperative for consumer responses.

Based on the survey conducted it was apparent that most participants had gained their knowledge of the energy sector from other sources than from their education. Education is considered to have a pivotal role in sustainable development and in increasing sustainable knowledge among consumers (Krajnc et al., 2008; Dincer, 2000). This might be another reason for the relatively low knowledge of the energy sector. Thus, educational outlets should consider providing consumers with knowledge related to the energy sector and its impact on the environment.

It was discussed in the literature review that some people in managerial positions, such as in energy companies, might be affected by cognitive inertia, and therefore experience difficulties in giving up traditional methods, even if they are proved to be unsustainable (Schillebeeckx et al., 2020). However, it could be proposed that prosumers could encourage companies to give up traditional and unsustainable methods in their production, since they have an important role in increasing competition and innovation in the energy sector (Sawyer, n.d.). This change, created by consumer and prosumer action, is illustrated by the multi-level perspective on sustainability transition framework (Geels & Schot, 2007; Geels 2011) and in the conceptual framework in Figure 1. In addition, from the findings in the interview it was clear that sustainable consumer and prosumer actions are viewed as opportunities by energy companies to create sustainable options to their customers.

Generally, it seems that most consumers are concerned about the environment and climate change. Based on both the quantitative and the qualitative research, the younger generation seems to be more worried about environmental concerns, compared to older generations. This means that in the foreseeable future, energy companies will have to provide increasingly more options for their customers when it comes to sustainable solutions in their energy use. Additionally, based on the quantitative research, energy consumers are largely in favor of governmental actions
and policies to incentivize a sustainable energy transition. This finding was supported by the survey made by The European Social Survey who had the same results in their findings (Pohjolainen et al., 2018). This means that along with the necessity of companies taking action, governmental action needs to be taken as well. This becomes more apparent, taking into consideration that the 13 largest energy companies, measured by the reserves they control, are owned and operated by governments (Bremmer, 2010). For state-owned energy companies it is crucial that the government realizes the demand for sustainable energy, in order for the state-owned energy companies to start taking action. These findings indicate that the current consumer perceptions are leaning towards a substantial interest in a sustainable energy transition, which requires drastic measures by governments and energy companies alike.

5.2. Limitations
The research conducted for this thesis included a few limitations. It was apparent during the data analysis part that the small sample size (N=85) of the quantitative data provided some limitations. This issue was taken into consideration when analyzing and discussing the findings of the study. With a larger sample size more significances could have been found from the questions presented in the survey. Additionally, due to the sample size some answers in the categorical questions had to be disregarded due to a low number of answers. This may have been avoided through more extensive testing of the questionnaire. The demographics of the sample size were limited to mostly young Finnish respondents, and this might have resulted to a data set that is not internationally comprehensive nor equally representative of the different age groups.

The qualitative research included only one participant from one energy company. Therefore, the findings cannot be sufficiently applied to other business models without some generalizations. Additionally, it cannot be excluded that there were no researcher nor respondent bias. However, the interview generated an adequate amount of data to provide insights to the research questions and meaningful implications to how the consumers affect the energy industry.

6. CONCLUSIONS
6.1. Main Findings
The aim of this thesis was to research the factors that drive a sustainable energy transition. It was found through the secondary research that new technology and innovation, consumer expectations and prosumer actions, and governmental energy policies together with renewable energy sources are the main factors that drive the energy transition towards sustainable systems. Furthermore, this thesis aimed to figure out the current perceptions of sustainable energy and how those perceptions incite action amid consumers. Through the primary quantitative research, it was found that most consumers have a high sustainability-focused value orientation and are concerned about climate change and protecting the environment. Additionally, sustainability-focused value orientation correlated with wanting to take more action to prosumer related actions. These findings would suggest that sustainable energy options are of interest to energy consumers and that some consumers would even be willing to produce their own energy in order to be more self-sufficient and sustainable in their energy consumption. This means that it is increasingly important for energy companies to provide renewable options for both consumers and potential prosumers.

Lastly, the thesis aimed to figure out to what extent consumer expectations and actions are affecting energy companies’ sustainable and renewable choices. From the primary qualitative research, it was found that generally energy companies face a high strain to turn to renewable and sustainable solutions from energy consumers and their preferences. However, it was found out from the quantitative data that energy consumers knowledge of the energy sector is relatively low. Increasing awareness of the energy sector and its aspects would incite more action amid consumers, which would in turn drive the sustainable energy transition further. The qualitative findings also indicated that energy companies should set clear and ambitious sustainability goals where they take their whole energy process into consideration. However, for a complete paradigm shift in the energy industry, a significant amount of further research and development, and governmental policy actions internationally are still needed.

6.2. Implications for International Business
This research provides many useful implications for energy companies internationally, even though the research was mainly based in Finland and Sweden. Based on the secondary research, it is apparent that energy companies need to contribute to an energy transition and that customer perceptions largely support it. The main factors
driving an energy transition are the same, regardless of the country of operation. Moreover, the implications of this study go further than solely energy companies, since the consumer perceptions affect businesses in other industries. The energy transition affects, more or less, all businesses, since energy is needed in all business activities.

From this study, it is clear that globally, energy companies should take their customers’ expectations and changes in consumer behavior into consideration to keep their value in the energy transition and in order to retain their customers. In addition, all energy companies should provide their customers with sustainable energy options and provide them with knowledge of those particular options.

**6.3. Suggestions for Further Research**

The findings section, the limitations section, and the section for implications for international business has brought up some suggestions for further research of this thesis topic. Firstly, a more global survey could be conducted to see the knowledge, values, and actions of consumers more internationally when it comes to sustainability and energy. In addition, a larger sample size would allow for more possible significances from the survey questions.

The primary quantitative survey done for this study was only targeted for private energy customers. It could be suggested that a similar survey be conducted to business customers of energy companies, since they account for a large part of energy end-use. Thus, it would be of importance to figure out their contribution in the energy transition as well.

A larger research could be conducted with industry specialists and energy company representatives through interviews, to get a more comprehensive energy company perspective on the topic. Additionally, it could generate more insight into the differences in company values and figure out other actions energy companies are taking towards increasing their sustainable efforts and increasing emphasis on consumer needs.

This study brings up many areas which could be researched in future studies. For example, further in-depth research could be done on other factors presented in the
conceptual framework on the aspects of a sustainable energy transition (Figure 1). Additionally, to determine customers’ perceived actions more in depth, research based on presenting participants to example case situations could be done in the future. This could lead to more extensive information on how consumers react to certain situations and options.
REFERENCES


APPENDICES

Appendix 1: Survey

Bachelor's Thesis Survey - Perceptions on Sustainable Energy

Mandatory fields are marked with (*) and must be filled in to complete the form.

This survey studies consumer knowledge, opinions and actions related to sustainable energy. This survey is voluntary and your responses will be kept anonymous and confidential.

In order to be able to participate you need to:

- Have had to manage your own electric contract
- Completed upper secondary level education

Make sure to read each question carefully before answering. Note that some questions include descriptions for clarity.

This survey will take about 6 minutes to finish. If you have any questions regarding the survey or my thesis, send me an email at emilia.sundqvist@aalto.fi.

For a chance to win 20€ make sure to add your email at the end of the survey.
- The winner will be contacted through email and the money will be sent via mobilepay.

Your answers are valuable and greatly appreciated!

1. What is your current educational level? *

   ○ Secondary school
   ○ Bachelor's degree
   ○ Master's degree

2. When was the last time you have managed your own electric contract *

   Input month and year: *

   In this part of the survey you will rate your knowledge regarding the energy sector. Answer as realistically and truthfully as possible.
3. How would you rate your general knowledge of the energy sector? *

4. How would you rate your knowledge of different energy sources? *

5. How would you rate your knowledge of the environmental impact created by the energy sector? *

6. Do you want to expand your knowledge of the energy sector? *
   - Yes, and I am willing to take actions in order to expand my knowledge
   - Yes, but I am not bothered to take any action of my own
   - No

7. Where have you gained your current knowledge of the energy sector? *

In this part of the survey you will express your opinions on different topics related to the energy sector and sustainability.
8. I care about *

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>protecting the environment *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>the use of renewable energy sources *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>energy security *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

9. I am worried about *

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>the use of fossil fuels *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>energy becoming too expensive *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>energy supply being interrupted due to reasons like technical failures, natural disasters, or by insufficient power generated *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>climate change *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

10. To what extent do you feel a personal responsibility to try to reduce climate change? *

![Response Scale]

Not at all  
Somewhat

11. To what extent do you agree with the following statements? *

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I consider myself an environmentally responsible consumer *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I believe that the use of renewable energy sources is environmentally responsible *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
12. To what extent do you agree with the following statements? *

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree nor disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think it is more important to save environmental resources than to be able to consume a lot *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is important to me to learn something about the ecological advantages and disadvantages of a product *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In my opinion, it is reasonable that consumers have to pay higher prices for products that cause environmental damage *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In my opinion, acting socially responsibly should be the foundation for all managerial decisions *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From my point of view, companies have a special social responsibility beyond making profits *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainability is, in my opinion, more important for society than economic growth *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personally, I think it is very important that companies act in an ethically correct manner *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It really bothers me if I found out that a company treats its employees unfairly *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think that firms have a responsibility to treat their customers always in a fair way *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. How likely do you think that *

<table>
<thead>
<tr>
<th></th>
<th>Not at all likely</th>
<th>Slightly likely</th>
<th>Very likely</th>
<th>Extremely likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>limiting your own energy use would help reduce climate change? *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>changing to renewable energy would help reduce climate change? *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>producing your own energy would help reduce climate change? *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

14. To what extent are you in favor or against the following policies in your country? *

<table>
<thead>
<tr>
<th></th>
<th>Strongly against</th>
<th>Somewhat against</th>
<th>Neither in favor nor against</th>
<th>Somewhat in favor</th>
<th>Strongly in favor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing taxes on fossil fuels, such as oil, gas and coal *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Using public money to subsidise renewable energy, such as wind and solar power *</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

15. How important are these factors when it comes to choosing your energy provider? *

<table>
<thead>
<tr>
<th></th>
<th>Not at all important</th>
<th>Slightly important</th>
<th>Important</th>
<th>Very important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Sustainability</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Reliability</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Customer service</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Contract terms</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
16. What do you think is the most important benefit of renewable power? *

- Better for the environment than regular power
- Better for the human health than regular power
- Better for the economy than regular power
- Other, please specify
- I do not think renewable power has any benefits

In this part of the survey you will answer questions about your own actions related to energy consumption and production.

17. How often do you take action to reduce your overall energy use? *

<table>
<thead>
<tr>
<th>Never</th>
<th>Hardly ever</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

18. What actions do you take to reduce your overall energy use?

- I turn off unnecessary lights
- I unplug unused electronics
- I use energy efficient lighting
- I use energy efficient appliances
- I wash only full loads of dishes and clothes
- I do not use unnecessary heating
- Other, please specify
19. How confident are you that you could use less energy than you do now?

<table>
<thead>
<tr>
<th>Not at all confident</th>
<th>Slightly confident</th>
<th>Very confident</th>
<th>Extremely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

20. This set of questions asks about your OPTION to choose your energy provider. Answer the following statements.

<table>
<thead>
<tr>
<th>I have the option to buy renewable power from my electric/utility company</th>
<th>Yes</th>
<th>No</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have the option to buy renewable power from someone other than my current electric/utility company</th>
<th>Yes</th>
<th>No</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have resources to spend 5-20€ more each month to have some of the power for my home come from a renewable source</th>
<th>Yes</th>
<th>No</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have the option to switch energy provider</th>
<th>Yes</th>
<th>No</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

21. This set of questions asks about your BEHAVIOR in choosing your energy provider. Answer the following statements.

<table>
<thead>
<tr>
<th>I buy renewable power from my electric/utility company</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I buy renewable power from someone other than my current electric/utility company</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I spend 5-20€ more each month to have some of the power for my home come from a renewable source</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have switched energy provider more than once</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
22. Rank the following 5 factors, from the most important (1) to the least important (5) factor affecting your decision to switch energy provider *

<table>
<thead>
<tr>
<th>Factor</th>
<th>Select</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td></td>
</tr>
<tr>
<td>Sustainability</td>
<td></td>
</tr>
<tr>
<td>Customer service</td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
</tr>
<tr>
<td>Contract terms</td>
<td></td>
</tr>
</tbody>
</table>

23. I would switch energy provider if the company was exposed for unsustainable production methods *

- Yes
- I would consider switching to another company
- No

24. To what extent do you agree with the following statements? *

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I want to be more self-sufficient when it comes to electricity *</td>
<td></td>
<td></td>
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<tr>
<td>I want to have more agency when it comes to my electricity supply *</td>
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<tr>
<td>I want to be able to produce my own energy *</td>
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<tr>
<td>I have taken actions to reach above mentioned statements *</td>
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</tbody>
</table>
Appendix 2: Interview outline

General questions

1. What is your official title at Vattenfall?
2. For how long have you worked for Vattenfall?
3. What are the main responsibilities of your position at Vattenfall?

Energy process

4. What aspects of the energy process do you think needs the most attention regarding innovation and technology development?

Values of Vattenfall
5. What are the views of Vattenfall on sustainable energy?

6. What are the main factors that drive Vattenfall’s actions and way of conducting business?

7. How much does Vattenfall value these three factors from 1-5 (1 = not important and 5 = extremely important) and how can this be seen in the company’s actions?
   a. Profit
   b. Customers
   c. Sustainability

Vattenfall’s sustainability

8. What improvements and/or innovations has Vattenfall planned for the future regarding sustainability?

9. What is the main reason for Vattenfall to contribute to a sustainable energy transition?

Consumer and prosumer behavior

10. How would you describe changes in customer preferences in the past 15 years in the energy industry?

11. Has Vattenfall taken measures to raise consumer awareness about the energy sector and its aspects?
    a. When taking these measures, what aspects of the sector do you focus on?

12. What measures do you take in order to take consumers into consideration in Vattenfall's decision making?

13. There has been a rise in consumers who are willing to produce their own energy through solar panels etc. Does Vattenfall view this as a threat or as an opportunity?

14. Does Vattenfall provide options or incentives for consumers willing to turn into prosumers?

Other

15. Do you have anything else to add? Or something you would like to discuss that we haven't yet?