Universiteit Utrecht

The impact of policy attributes and developer background on renewable energy technology investment.

A case study of the *Stimulering Duurzame Energieproductie+* subsidy.

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Tebbe van Oort

3287858

Abstract

In order to improve the amount of private investment in renewable energy projects, numerous government support schemes have been established. These support schemes are often aimed at reducing the risks associated with renewable energy technologies and improving their return. However, many of these support schemes proof to be ineffective or fail to fully meet their goals. Scholars have noted that in order to explain the effectiveness of government support schemes a techno-economic analysis falls short of explaining why some subsidies are more effective than others. This study moves beyond the pure techno-economic analysis by also including the background of renewable energy project developers into the equation. This study uses a mixed method approach. First interviews were conducted among developers and experts, followed by a discrete choice experiment. The interviews were used to gain a deeper understanding of the workings of the studied case, and to make the discrete choice experiment more aligned with real life situations. The results show that the developers background can in some cases influence the investment decisions. Furthermore, the results also confirm that for the largest part investment decisions are influenced by return on investment and the risk associated with the investment. However, the degree with which these factors influence developers investment decisions may vary with the developers background. The theoretical and practical implications are, future studies and policies should beyond a pure risk and return assessment when analyzing renewable energy subsidies and include the effects of the renewable energy developers' backgrounds in their assessment.

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1. Introduction

Investments in renewable energy in combination with government subsidies and favorable policies are seen as good investments with high returns, however the cumulative investments in renewable energy in developed countries is still quite low. In addition, the effectiveness of subsidy schemes varies (Bürer & Wüstenhagen, 2009). Investments in renewable energy technologies have increased steadily over the past decade. It is estimated that renewable energy has attracted more than 2 trillion USD in investments over the 2004-2014 period (Frankfurt School-UNEP, 2015). Nonetheless, over the coming years much more private investments are needed. As most investments in renewable energy are still unprofitable without government support many governments have launched fiscal measures and subsidies. In 2011 the Dutch government established the revised version of the "*Stimulering Duurzame Energieproductie"* support scheme, a renewable energy technology (RET) support subsidy, which was named *"Stimulering Duurzame Energieproductie+"* (SDE+). The SDE+ subsidy aims to improve the number of private investments in RET, by making investments in RET less risky and achieve higher returns. Until recently public investment has been the main driver behind investments in renewable energy (RE) (Wüstenhagen & Menichetti, 2012). Private investment on the other hand, has only played a limited role in the RE industry and is only now slowly beginning to take over the role of public investment (Mathews et al., 2010).

Investments in renewable energy, like any other investment, are determined by the fundamentals of finance theory; risk and return. Investors weigh the levels of risk and returns of their different investment opportunities and if they are rational they will pick the opportunities that yield the highest returns at the lowest risk (Bodie et al., 2011; Campbell, 1993). Renewable energy projects naturally have a higher risk compared to conventional energy projects, because of the unpredictability of environmental externalities (Wüstenhagen & Menichetti, 2012). The SDE+ subsidy reduces the risks resulting from these environmental externalities. At the same time it keeps market signals intact by protecting investors only to a limited extent from price fluctuations. This sets the SDE+ subsidy apart from other subsidies that suffer from inefficiencies due to a lack of market forces, such as feed-in tariffs. However, the results of the SDE+ subsidy have been below expectations. The main reason for this is that many projects in practice are delayed or not developed at all (Algemene Rekenkamer, 2015). In order to meet the 2020 goals for renewable energy set by the Dutch government, more funds have been made available by the Dutch ministry of economic affairs this year (RVO, 2016).

Recently, scholars noted that a techno-economic analysis purely based on a risk and return assessment of energy alternatives is insufficient to explain RE investments (Masini & Manichetti, 2013). Masini and Manichetti (2013) argue that many policies have only partially achieved their goal, because they did not match with the drivers behind investment decisions. In addition to the rational financial evaluation of investment opportunities, the inclusion of non-financial factors, such as background and experience, will lead to very different resource allocations. Wüstenhagen and Teppo (2006) for example found that among venture capitalists (VCs) there is a huge difference between the perceived risk and return and the actual risk and return of investments in RE. In addition to background and experience, there is only little research on the relation between attributes (e.g. the design of the policy, available funds and difficulty of applying) of the subsidy and decision to invest in RET (e.g. Lüthi & Prässler (2011)). Also the effects of corporate image improvements by adopting RET (eg. Chen et al, 2006) are not taken into account when looking at RET investments. Variations in the attributes of subsidies might explain the level of success that subsidy policies have (Lüthi & Prassler, 2011). This research addresses the lack of empirical research done on attributes of subsidy and their relation to the decision to invest. Additionally, this research takes into account different backgrounds and variations between technologies.

I will answer the following question: To what extent do SDE+ subsidy attributes and developer background influence the decision to investment under the SDE+ subsidy by RE developers?

Developers can be categorized as companies that have invested in RET in the past or are planning to invest in RET in the future as a means to supply their business activities with RE, and are able to fund projects themselves or attract regular forms of finance to fund projects, such as bank loans. Developers of RET are often privately held companies. They are responsible for a large part of the investments in RE especially in the large Dutch horticulture industry, an industry in which energy is a large part of the operational costs.

I will answer the research question using a mixed method approach, a qualitative approach and a quantitative approach. First the qualitative research will consist of interviews with developers of RET to gain a deeper understanding of their investment decisions. Together with information gathered in the literature review, the results from this qualitative research were used to establish a basis for the subsequent quantitative research. This quantitative research consists of a sample of questionnaires and a Discrete Choice Experiment. The research makes the following contributions; it firstly provides a better theoretical understanding of the effects of the different attributes of subsidies on the choices that investors make. Secondly, it gives policy makers a better understanding of what the effects of different attributes of the subsidy are on the decision to invest in RE sources by developers. By measuring the effects of the different attributes separately, the magnitude of each attribute can be established and policies in the future can be adjusted accordingly. Additionally, it gives research institutes such as the Energy Research Centre of the Netherlands (ECN) a better understanding of why developers apply for SDE+ subsidy and why projects might fail to come off the ground.

In the next section an overview of the literature will be given. Section three will contain the methodological approach for both the qualitative and the quantitative analysis of this mixed method research. Furthermore, section a description of the relevant aspects of the case, the SDE+ subsidy, will be given.

2. Literature review

Previous research into the relation between investment choices and renewable energy policies was mainly aimed at VCs and other investors (Bürer & Wüstenhagen, 2008; Bürer & Wüstenhagen, 2009; Dinica, 2006; Wüstenhagen & Menichetti, 2012; Masini & Menichetti, 2012; Wüstenhagen et al., 2007; Wüstenhagen & Teppo, 2006). The rationale behind this was that improving the share of VC that goes to RE would significantly accelerate market diffusion of RET (Bürer & Wüstenhagen, 2008). However as RET develops, the product moves from the niche market to the full commercial market thereby making venture capital a less adequate form of finance. Following this trend, other forms of finance such as bank loans, debt and equity start to pick up and become more important, to finance RET projects. Hence, government policy should adjust accordingly (Grubb, 2004). Also Langniss (1996) showed, by categorizing different types of investors, that different types of support will attract different types of investors. Hence, as the RE market is maturing, investments in RE are becoming less risky. Making it easier for RET developers to attract other form of finance. This makes it logical to shift the focus from VCs to developers of RET projects (Lüthi & Prässler, 2011). Lüthi & Prässler (2011) are one of the first to move the focus from investors to developers of RET projects, as they expect that this will result in different needs from energy policy. This research will also shift the focus from VCs to developers of RE projects, as the RE market has grown in size and can no longer be categorized as a niche market. Next I explain the basic model of risk and return from which all economic investments are made, followed by a review of relevant studies on RET investments and energy policies.

2.1. In the literature identified factors influencing investment decisions

There are many factors that can have an effect on the developer's decision-making process. For this reason the focus in this section will be theory that can be described the regulations and policy settings that can be influenced by policy makers. This encompasses all aspects that involve or have the possibility to be influenced by governmental action (Butler & Joaquin, 1998). Besides the regulatory factors there are also attributes of the developer itself that may influence the decision whether or not to invest in RET.

Risk and Return

A basic model of the effects of risk, return and policy is used to understand what determines investments in RET. In finance theory risk and return are the fundamentals that determine how completely rational investors choose among different investments (Bodie et al, 2011). In theory investors rationally weigh different investment options and will choose the investment with the highest return for the given level of risk (Bodie et al, 2011; Bürer & Wüstenhagen, 2009). It is suggested that the variations in the outcomes of policy can for a large part be explained by how far policies can reduce the risk for investors. Lower risk means lower costs as the costs of capital decreases for lower risk renewable energy projects. (Wiser & Pickle, 1998; Langniss et al., 1999; De Jager & Rathmann, 2008).

Currently, RE is still at a disadvantage when energy investment decisions have to be made. Firstly, RE tends to be at a disadvantage because environmental externalities increase the risk over conventional energy alternatives (Bürer & Wüstenhagen, 2009). Secondly, RE technologies offer lower returns compared to conventional energy technologies (RVO, 2016; CE Delft, 2016). In order to improve the equation governments have established policies, to increase returns of RET either by providing subsidies such as the SDE+ policy or by reducing the risk of investments in RET with policies such as "green loans" which are guaranteed by the government (Wüstenhagen & Menichetti, 2012).

The SDE+ subsidy aims at creating better circumstances for RET by on the one hand reducing the risks associated with RET and by improving returns on investments on the other. An important aspect of the SDE+ subsidy is that it keeps market signals intact and does not eliminate all the risk from falling energy prices. By placing a cap on the subsidies it prevents windfall profits (RVO, 2016). The SDE+ subsidy thus forms a unique instrument in creating market conditions at par with conventional technologies for RET. Currently, the SDE+ policy is the only policy of this specific kind.

It should be mentioned however, that recently scholars noted that not all emphasis can be put on techno-economic analysis, but that also non-rational factors and social factors can influence investment decisions (e.g. Devine-Wright, 2007; Wolsink, 2007; Chasot et. Al, 2004). For example, Chasot et al. (2004) argues that a government subsidy itself can be seen as a risk, especially among Anglo-Saxon investors as they are more free-market orientated.

Corporate image

The corporate image is the mental picture that people have of an organization (Gray & Balmer, 1998). A corporate image can be easily created through good communication with the customers. According to Gray and Balmer (1998) a good corporate image and corporate reputation can lead to a competitive advantage. Furthermore, a study by Chen, Lai and Wen (2006) in Taiwan found that companies that implemented sustainable innovations would get a competitive advantage as they were able to ask higher prices for "green" products. In addition, companies could communicate a favourable corporate image to the public. Also, Shrivastava (1995) argues that companies can gain a competitive advantage by managing ecological variables. By this the author means investing in more efficient production methods as well as new technologies that reduce waste and are more energy efficient. In doing so companies can expand market demand, or bring new products to market.

Background & Experience

As economic actors suffer from bounded rationality (Simon, 1955), perceived risks play an important role in the decision making process of investments. Wiser et al. (1997) found that one of the main difficulties for developers in obtaining financing for renewable energy projects are, perceived resource & technology risks and high support policy risk. Also Bürer and Wüstenhagen (2009) found that VCs preferred making investments in RE projects that had the least amount of policy risk.

RET is inherently still seen as an unproven technology (Masini & Manichetti, 2012), on the basis of a lack of experience with the technology. For this reason, investors may perceive risks more highly associated with RETs as compared to conventional technologies (Wüstenhagen & Menichetti, 2012). This is also in line with previous studies done on investors, which have shown that investors suffer from status-quo bias (Pitz & Saschs, 1984; Barnes, 1984; Samuelson & Zeckhauser, 1988; Katz, 1992), meaning that existing technology paths are valued more highly than new technology paths (Wüstenhagen & Teppo, 2006). Therefore developers that have not previously invested in RET will value their conventional technology more highly and will therefore gain a higher utility from the conventional technology at the same levels of risk and return. Meaning that perceived risk and return are often related to the background and experience of the investor (Wüstenhagen & Teppo, 2006).

Recently, scholars noted that a techno-economic analysis purely based on a risk and return assessment of energy alternatives is insufficient to explain RE investments (Masini & Manichetti, 2013). Masini and Manichetti (2013) argue that many policies have only partially achieved their goal, because they did not match with the drivers behind investment decisions. In addition to the rational financial evaluation of investment opportunities, the inclusion of non-financial factors, such as background and experience, will lead to very different resource allocations.

The conclusions from the studies mentioned above provide valuable insights into the effects that different attributes have on the decision to invest and develop RET. In the following section I will outline how these different aspects of policies were operationalized in the case of the SDE+ subsidy.

3. Research approach and the SDE+ case

3.1. Qualitative and Quantitative Experimental Designs

In order to stipulate what drives developers to apply for SDE+ subsidy, this research used a mixed method approach, using both qualitative and quantitative research. The purpose of using this form of research was that the combination of qualitative and quantitative research provides a better understanding of a research problem at hand than either research approach would alone. The qualitative research was used to gain a deeper understanding of the SDE+ subsidy workings to make the quantitative research more adjusted to this case. The quantitative research, based on the theory described above and the qualitative research, was subsequently used measure the effects of the attributes on the developers decision to invest in RET under the SDE+ subsidy.

As there is a lack of research on the SDE+ subsidy in relation to theory on subsidies, the interviews were used to establish whether, in the case of the SDE+ subsidy, there is a relation between the theory and the studied case. In addition, the interviews made it possible to capture factors that influence developers decisions to invest under the SDE+ subsidy but are not described in the general theory on subsidies. In addition, the interviews made it possible to establish the range of the attribute levels used by developers when measuring investments under the SDE+ subsidy. Subsequently, the Discrete Choice Experiments were created based on the outcome of the interviews and the existing literature on the measured attributes.

3.2. Case: Stimulering Duurzame Energieproductie+ (SDE+)

The SDE+ subsidy is a Dutch subsidy to stimulate investments in renewable energy sources within the Netherlands. At the time of writing, the subsidy is divided among different renewable energy sources. Namely, hydropower, wind energy on land, PV systems, geothermal (among which cogeneration plants), gas from water treatment plants, biomass gasification, and waste incineration plants. The aim of the SDE+ subsidy is to get the cheapest generation form of each energy source first. Using a form of first-price sealed bid auction system companies and institutions can bid for the subsidy at the price per kWh of their choosing. However, there is a limited amount of subsidy available. Thus the lower the bid price the higher the chances of receiving subsidy. As the workings of the SDE+ auctions a fairly complex, a more detailed explanation can be found in a recent study conducted on the effectiveness of the SDE+ subsidy by CE Delft (CE Delft, 2016).

Since 2015 most applicants are required to provide a feasibility study of the project they are applying for. This is required because in the past, the SDE+ budget was drained quickly by projects that weren’t realized, because they either were not feasible or turned out to be more expensive than anticipated, leaving large parts of the subsidy budget unused (RVO, 2016). However, this does put an extra administrative burden on the applicant. The upside of the feasibility study is that applicants are better informed about the return, costs and risks of their investment, making them better-informed respondents.

The SDE+ subsidy provides an excellent case for testing investment across different RETs as well as across developers with different backgrounds. As the subsidy is open to all companies and encompasses almost all RETs. This should allow variations between different technologies and developer backgrounds. Furthermore, the SDE+ subsidy has varying attributes which many other subsidies lack. The SDE+ allows for variation in the length of the subsidy as well as the amount of subsidy that is received. This forms an ideal situation to test varying attributes of the subsidy and the effect on the willingness of developers to invest.

4. Qualitative Research

4.1.1. Data collection

Qualitative data for the study was collected through a total of eight semi-structured interviews, with interview questions based on the method as further described below. The interviews were used to establish whether the factors influencing developers investment as described in theory are also relevant in the case of the SDE+ subsidy. Eight interviews were seen as sufficient as the respondents gave no new relevant information and gave similar answers to the questions. Secondly, the interviews were only used to establish relevance and not as a means of providing significant answers.

Semi-structured interviews gave the interviewees the opportunity to answer free of the interviewer's interpretation or pre-stated direction and allow for a more flexible interview process. Interviews were held in the interviewees' native language Dutch. Each of the interviews lasted approximately thirty minutes, and were transcribed by the interviewer within forty-eight hours on completion of the interview. The transcripts were sent to the interviewees for review to avoid any misinterpretations.

Additional literature

In addition to the theory provided in section two, this research also looked at other factors that according to theory could influence developer's decisions to invest, among which the duration and difficulty of the administrative period (Lüthi & Wüstenhagen, 2012; Masini & Manichetti, 2012) and the difficulty of finding funding for the project (Lüthi & Prässler, 2011). However, during the qualitative pre-study these theories were found not to be applicable to the SDE+ subsidy. According to the interviewees these factors had no influence on their decision to invest. Therefore, they were not included into the theory section as such, however they were part of the qualitative study.

4.1.2. Sample selection

The sample selection focused on companies and institutions that are able to apply for SDE+ subsidies. Companies and institutions are able to apply for SDE+ subsidy if they have a Dutch based entity and develop a renewable energy project in the geographical area of the Netherlands. As a result, the sample will be limited to companies and institutions that are based in the geographical area of the Netherlands.

The interviews were conducted among experts in the field of the SDE+ subsidy and developers of RET. As mentioned above eight interviews were held. One of the interviewees was an expert from an institution that develops the SDE+ subsidy and the other seven were interviewees from companies or consultancy firms that work with applications for SDE+ subsidy on a regular basis. The SDE+ subsidy covers many technologies among which, Biomass, Wind on Land, Solar Photovoltaic and Solar Thermal. For this reason, the interviews were conducted with developers and experts who have experience with multiple of the technologies under the SDE+. The advantage of having developers and with experience in multiple technologies is that they can identify differences between technologies under the SDE+, but also can identify factors that affect at least multiple technologies under the SDE+ subsidy and not just factors that influence a single technology. The sample for the interviewees was composed using ECNs business network and snowball sampling.

4.1.3. Interview Structure

The aim of the interviews is threefold. Firstly, it is to establish if the attributes identified from the literature review are perceived as important in the case of investments under the SDE+ subsidy. This means that the interviewees are asked when they make a decision to invest in RET with SDE+ subsidy if take into account the attributes identified in the literature (e.g. if they take into account how long it takes to apply for SDE+ subsidy). Secondly, how the attributes identified in the literature are applied in practical situation. If an interviewee deems an attribute as having an impact on the decision whether to invest or not, the interviewee is subsequently asked how he or she looks at this attribute in practice (how he would quantify the attribute). Finally, the interviews are explorative in nature to gain a better understanding of the SDE+ case specific situation and whether there are any factors that influences the developers decision to invest, but not captured by the attributes derived from the theory on RE subsidies. Table 1 shows the data categories for the different attributes that have been identified from the literature review. Each attribute was "measured" in the same way according to the different categories. The categories refer to the manner in which the attribute effects the decision to invest in RET and how this attribute is quantified by the developer when taking the attribute into consideration in an investment decision. The interviews started with the explorative part, to avoid influencing the interviewee with the predefined subjects. The explorative part established whether there are categories that have not yet been established in previous studies or that are very case specific.

Dimension	Attribute	Categories
Administrative process	Administrative Period	Perceived Importance of attribute in making investment decision How is the attribute quantified by the developer
	Administrative requirements	Perceived Importance of attribute in making investment decision How is the attribute quantified by the developer
Funding	Ease of finding funding	Perceived Importance of attribute in making investment decision How is the attribute quantified by the developer
	Amount of funding	Perceived Importance of attribute in making investment decision How is the attribute quantified by the developer
Risk and Return	Level of Return under SDE+	Perceived Importance of attribute in making investment decision How is the attribute quantified by the developer
	Level of Risk under SDE+	Perceived Importance of attribute in making investment decision How is the attribute quantified by the developer

Table 1: Interview categories

4.1.4. Interview Questions

The questions asked to the experts and developers of RE will follow a similar structure, but the questions are posed so that they match with the expertise of the different interviewees. All the questions are directly related to the categories that are presented in above, administration process, funding, risk & return and SDE+ case specific difficulties.

The categories are deducted from previous studies described in chapter two and provide the general topics for the interviews. All questions concerning the different dimensions started with an open question. This allows the interviewee to answer freely, so as to minimize potential bias. After the interviewee has given his own interpretation but has not touched upon the specific categories as described in the theory, more specific questions were asked on subjects around those dimensions that were not covered by the interviewee's initial answer. In order to give the interviewee a more visual interpretation of some of the questions, vignettes were shown with effects that they should consider it in their answer. For example, a question about how the interviewee handles risk a vignette where a risky case was shown and he was asked if he could interpret the effect of this on his decision.

Before the initial interviews, the interview questions were tested among peers in pilot studies. The final interview schedule can be found in ***Appendix A***.

5. Quantitative Research

5.1. Interview Results

In order to establish what businesses see as important factors that influence the decision to apply for SDE+ subsidy, interviews were conducted among experts, consultants and energy companies. Among the experts are representatives of Dutch horticulture sector and government officials. The choice for consultants is based on the fact that most companies that invest in RE projects choose not to do this themselves. Furthermore, they have experience with a larger number of technologies and are able to point out the differences. The energy companies have been included into the interviews as they are responsible for the largest part of investments under the SDE+ subsidy, next to the agricultural sector where most of the companies that develop projects under the SDE+ are active. It is important to keep in mind that most of the interviewees therefore relate their answers to experiences within the agricultural sector. The interview questions based on the literature review from chapter two, will be analyzed in this section and compared with the literature review.

The interviews show that there are differences between what the respondents see as important attributes that influence their decision to develop technologies under SDE+ and what the theory suggest as factors that influences developers in their decision. For example, difference are observed in the value of the administrative process and the ability to finance projects. However, also similarities can be found.

According to the respondents there is a strong relationship between the willingness to invest and the level of return and risk. The following section will outline the results from the interviews.

Risk and Return

All the interviewees mention that return is an important aspect when it comes to investment decision under SDE+. In the larger energy companies return is mostly important because investment have to compete for a limited amount of available funding. But also in other businesses return is an important factor. As one respondent describes it: *"After receiving confirmation for the (SDE+) application… then you go to the board and they eventually say no the return is too low"* [R4]. Most of the interviewees say that they see returns on projects vary between 12,5% and 20%. However, there are also exception for some technologies returns as low as 5% are possible, mostly in solar projects, but also as high as 33% for technologies that have a higher risk of technology failure. Examples according to the interviewees can be seen in digester projects and geothermal projects.

Furthermore, the interviewees mention that businesses invest in RE projects for the continuity of their business activities. They argue that many cultivators in particular have fluctuating incomes because of fluctuating gas prices, which is used to heat their greenhouses. RE projects with SDE+ allows cultivators to fix their energy prices for 8 to 15 years, which removes fluctuations from their income. As a result, the SDE+ subsidy removes the risk of energy prices, in projects where the energy is used for own consumption. But also in projects where the energy is sold back to the grid, the subsidy is seen as risk reducing. IT allows businesses to create a steady stream of revenues for the duration of the subsidy once the subsidy has been granted. This according to the interviewees [R2-5] is seen by businesses, mostly among farmers, as something that improves the continuity of their business. For this reason, the interviewees [R2-5] argue that farmers in many cases will also expect longer payback periods as they have their horizons set further.

SDE+ Case specific

Almost all interviewees mention that one of the reasons that they invest in renewable energy projects is that these projects give companies a "green" appearance. Especially in the agricultural business, companies feel that this gives them "*a license to produce*" [R2,R3]. They feel that society in the Netherlands is critical of their business activities and renewable energy gives them the ability to show that they are producing in an environmentally friendly way.

For larger energy the reason to invest in renewable energy projects is that conventional technologies will reflect negatively on their company; *"We will not invest in a new coal plant, even when we could earn a lot in doing so, we know that is societally unacceptable. We would shoot ourselves in the foot"* [R1]. Furthermore, they mention that they are bound to the Dutch energy agreement that they signed. Which means that they are obliged to move to a more sustainable production portfolio. In addition, the interviewee mention that because of the discussion around the sustainability of biomass that is currently ongoing in the Netherlands, companies are holding off investments in these kinds of technologies. The reason for this is that this discussion creates uncertainties around whether these technologies will remain qualifiable for subsidies in the future.

In addition, many of the interviewees argue that it the required return is dependent on the type of business and the type of technology that is used for RE project under SDE+. For example, they argue that geothermal projects should have a payback period of 4 years as they have a larger risk of technology failure. On the other hand according to one interviewee [R2] some businesses aim want to achieve continuity of their business. Meaning that the height of the return is not the issue rather they like to see a reduction in risk for a longer period.

5.1.1. Attributes & Levels

From the interviews and theory a number of attributes that influence developers decisions to invest in RE projects can be identified. Both the interviews and the literature review identifies risk and return as attributes that influence developers decisions to invest in RE projects. Project returns under SDE+ vary between technologies. According to the interviewees the yearly return is between 5% and 20% for most projects. However, they also mention that for most developers a yearly return of 15% on a project is really the minimum.

Also according to general investment theory return forms one of the basic motivators to invest. Therefore, an attribute giving the expected yearly return on the project will be added to the list of attributes. The level of return is measured in the same way the as it is measured in the example calculation models of the SDE+ subsidy. The attribute will range 5% to 25% annual return on investment with intervals of 5%. Although most projects vary from 5% to 20% yearly return, 25% yearly return is added as some technologies, according to the interviewees, have higher risks and are only seen at viable at this level of return.

Risk from the subsidy itself is seen as neglectable, the largest risk is formed by the fact that some technologies, such as biomass technologies, require fuel and the fuel price might fluctuate. Overall, developers do see the subsidy as risk reducing. The SDE+ subsidy provides an income certainty for the period for which the subsidy is granted. This stands in contrast with what Chassot et al. (2004) argue, as they argue that subsidy might be seen as a source of risk. The reason for this is probably that once SDE+ subsidy is granted, the subsidy is granted for a predetermined number of years, and can’t be ended half way through this period. All interviewees see the subsidy as risk reducing during the period for which it is granted, thus the level of risk for developers is seen as higher when the subsidy is granted for a shorter period. As a result of these findings, the number of years for which subsidy is granted is included in the choice experiment. Normally SDE+ subsidy is granted for a period of 8, 12 or 15 years. The attribute in this case will have a wider range and the periods of 5 and 10 years are also included. This to test a wider variety of possibilities than normally would be the case, especially the shorter period of 5 years provides an interesting case. As this could capture whether developers prefer higher returns or a longer period of "lower risk".

As mentioned before, the largest risk that the interviewees see is the one stemming from variable fuel prices. One interviewee mentions that they include the risk of fluctuating fuel prices in their calculations and adjust the expected costs accordingly. Technologies that require biomass to operate therefore have added risk, the risk that fuel prices will increase once these technologies are employed on a wider basis, because of scarcity. On the other hand biomass technologies are not intermitted and are not affected by environmental externalities from which other RET suffer (Bürer & Wüstenhagen, 2009). An attribute is added to measure the effect of fluctuating fuel prices on their decision to invest. This attribute is a binary attribute which states whether or not the technology uses biomass as a fuel.

The interviewees all mention that the fact that they invest in RE because it has a positive effect on their business activities. However, there are differences between technologies. Using biomass to generate RE is not seen as environmentally friendly as using wind energy or solar energy, especially when it comes to the co-firing of biomass in coal plants. Furthermore, green gas created from manure creates negative externalities for the surrounding area such as smells. This creates uncertainties among potential adopters according to the interviewees. Although it is hard to identify when a technology has a positive effect on the business activities of a company differences between technologies can be identified. Solar, Wind and Geothermal are seen as "more" renewable than technologies involving biomass and green gas. For this reason, an attribute will be added distinguishing between technologies that have a positive public perception and a neutral public perception.

Attributes and attribute levels

Attribute	*Project Return with SDE+ subsidy*	*Number of years of subsidy*	*Effect on corporate image*	*Fluctuating Fuel Prices*
Levels	5%	5 Years	Neutral	Yes
	10%	8 Years	Positive	No
	15%	10 Years		
	20%	12 Years		
	25%	15 Years		

Table 2

5.2. Research Design

The literature review in chapter two, together with the results from the exploratory interviews, which can be found in the previous section, create the groundwork for the development of the conceptual model. In order to establish the influence of the SDE+ attributes on investment decisions of RE developers, I used a Discrete Choice Experiment (DCE). DCEs are used to explain choices between two or more different discrete alternatives and are based on the random utility framework created by Nobel laurate McFadden (1974). In the random utility framework each respondent *(i)* attaches a given amount of Utility *(U)* to each of the discrete options *(j)*. U_{ij} consists an observed component (V_{ij}) and an error term (e_{ij}). In this research the observed component consists of the attributes of the SDE+ subsidy for each of the different investments options. The error term e_{ij} captures the unobserved factors.

$$U_{ij} = V_{ij} + e_{ij}$$

In this DCE the respondents receive a series of choice tasks, the respondents have to choose between three alternative investment options with different attribute levels. By varying the attribute levels over the different choice tasks, the respondents reveal the utility they attach to each of the different attributes. Within choice models it is assumed that the respondent will want to maximize its utility given the alternatives. Hence, the maximum utility for a given number of alternatives, is the sum of the attributes utility for the selected alternative (Hensher et al., 2015).

Respondents were given twenty tasks with three investments options and a none option. The choice tasks contain four varying attributes per investment option. All possible combinations of investments were included in the DCEs, this created 100 different choice tasks. The tasks were divided into 5 sets of 20 tasks. This resulted in 5 versions of questionnaires that were filled out by the respondents. The resulting sets of choice tasks formed an orthogonal design. ***Figure 1*** shows an example choice task. The results of this research are considered reliable at a significance level of alpha 5%.

If you have to make a choice, which investment would you prefer, A, B or C?....

Investment	**A**	**B**	**C**	**D**
Number of years subsidy	15 Years	5 Years	10 Years	I would not invest given these options.
Annual project return	10%	15%	10%	
Technology with fluctuating fuel prices	NO	YES	YES	
Effect on company image	Neutral	Positive	Neutral	

Figure 1: A translated example choice task

5.2.1. Background & Experience

After the choice experiment respondents are a number of questions that allowed for control variable as well as to establish what kind of background the respondent has. The respondents were asked questions about their experience and background. As previous experience with the SDE+ subsidy might result in a different perceived risk of a RET. Next to this, they were also asked what business sector they are active in and with what RET they have the most experience. It is expected that some technologies require a higher level of return than other technologies. Additionally, some business sectors may require larger returns than other business sectors. Additionally, they were asked how many employees their company had. To sum up, the questions that were asked were;

- Did you apply for SDE+ subsidy in the past?
- How many employees does your company have?
- In what sector in your company active?
- With what technology, for which SDE+ subsidy can be granted, do you have the most experience?

The answers to these questions were placed into categories, the resulting categories can be seen in table 3. Together with the choice experiment, they were placed online using the software program Lighthouse.

Covariate categories

Covariate	*Previously applied for SDE+*	*Number of employees*	*Sector*	*Technologies under SDE+*
Categories	Yes	0-10	Energy Sector	Garbage incineration
	No	11-24	Manufacturing	Biomass
		25-50	Investment Company	Biomass heat
		51-200	Agricultural Sector	Geothermal
		201-500	Supplier of renewable energy technology	Green Gas/ Gas form biomass
		>500	Government	Hydro
			NGOs or association	Wind
			Other	Solar PV
				Solar Heat

Table 3

5.3. Sample selection

For the selection of respondents, lists on SDE+ applications will be used from the Dutch *“Rijksdienst voor Ondernemend Nederland”* (RVO). RVO is a governmental institution that coordinates the SDE+ subsidy. These lists contains all projects, companies and institutions that have been granted a SDE+ subsidy. In addition they contain information on the size of the project and whether they have been realized or not. Companies that operate in energy intensive industries were contacted, such as energy companies, horticulture companies and water treatment companies. The aim here is to include companies that have not applied for subsidy into the sample. The research was presented to the respondents as a research for Utrecht University in conjunction with institutions that develop the SDE+ subsidy. All respondents received a request by email to fill out the questionnaire. Furthermore, some respondents were asked by telephone whether they wanted to participate in this research. In return, the respondents were offered a copy of the main findings of the research project. The sample contains 84 valid responses. In order to get this level of valid responses a much larger number of companies had to be contacted, around 873 or a response rate of 9,6%. In addition 16 questionnaires were filled in only partially and invalid. The reason behind the low response rate is that companies that invested in RET under the SDE+ subsidy form a popular study population for researchers and are therefore contacted on a regular basis by researchers. This research therefore tried to separate itself from other researches, as the results will be directly communicated back to institutions that develop the SDE+ subsidy. Hence, taking part in the experiment might benefit them in the future. In addition, companies received a reminder each week if they did not fill in the questionnaire yet.

The largest part of the contacted companies, around 80%, has previously applied for SDE+ subsidy and around 20% did not previous apply for a SDE+ subsidy. The companies that previously applied for SDE+ subsidy are, for the largest part, active in the agricultural business. These companies mostly use technologies that are complementary with their business activities and applied technologies such as manure fermentation and photovoltaics (large rooftop space). However, this sector also has the lowest response rate among all the sectors of about 2%. This can have a negative influence on the results, as not enough data may have been available on this sector to make accurate estimations. In addition to agricultural companies a large number of schools and semi-governmental institution were contacted. These institutions for the largest part applied for SDE+ subsidy on photovoltaic technologies. It is worth noting that photovoltaic technology is the most applied for technology under the SDE+ subsidy. Nonetheless, the largest amount of subsidy goes to a handful of larger projects in the co-firing of biomass, geothermal and wind technologies.

6. Quantitative Research Results

In this section I analyze the results from the DCE. I begin with a sort description of the data. The sample consists of 84 respondents of which 22% is active in the energy sector, followed by 18% in the investment sector, 15% as NGO or association, 14% in the manufacturing sector, 10% is supplier of renewable energy technology, 9% is government, and finally 6% agricultural sector as well as 6% in other categories. 12% of the respondents did not request SDE+ subsidy prior to taking part in the experiment. Furthermore, 48% of the respondents had the most experience with solar technology, followed by biomass 14%, biomass heat 11%, Wind 11%, Geothermal 6%, Green Gas 5% Solar thermal 3%, garbage incineration 3%, and 0% hydro with projects. It is not surprising that there are no respondents with the most experience in hydro projects considering that there are only four of these projects in the Netherlands. The developers of these projects were contacted however they did not respond. It would have been interesting to see the results of this group as they mostly use experimental technologies, however it is not expected that the omission of this group has influenced the overall results.

Using the Latent Gold 5.1 program I first estimated a conditional logit model. In this model the dependent variable indicates which investment is chosen out of three investment options, next to the three investment options a none option is included. The model contains two binary and two nominal five-level predictors. The model has an acceptable goodness of fit with McFadden R^2 of 0.27. In addition, all the attributes estimated in the model are highly significant at the 0.1% level. The conditional logit model can be seen in table 4.

Conditional Logit Model					
Number of Observations	1401				
Model Chi-Squared	2882				
McFadden R²	0.27				
	Level	**Estimator**	**p-value**	**Significance**	**odds ratio**
Annual project return	5%	Ref			
	10%	1.4777	1.20E-12	***	4.38
	15%	2.2695	4.20E-32	***	9.67
	20%	3.0733	1.70E-58	***	21.61
	25%	3.4723	3.40E-72	***	32.21
Number of years of subsidy	5	Ref	.		
	8	0.487	0.00027	***	1.63
	10	1.0042	1.60E-15	***	2.73
	12	1.2638	1.60E-20	***	3.54
	15	1.3731	1.00E-23	***	3.95
Effect on corporate image	Neutral	Ref	.		
	Positive	0.7066	6.50E-21	***	2.03
Fluctuating fuel prices	No	Ref	.		
	Yes	-0.9095	2.10E-30	***	0.40

Table 4 **p < 0.05, **p < 0.01, ***p < 0.001 displays significance level of z-test*

In addition to the conditional logit model, a continues scale class was explored (Table 5). Due to differences in choice consistencies among the respondents, a bias can exist in the model estimators (Swait, & Louviere, 1993). Scale classes can correct for this bias by clustering respondents with a similar degree of choice consistency, according to the variance in their responses (Magidson & Vermunt 2007).

The continues scale class model has a good goodness of fit with a McFadden R^2 of 0.33. In addition, this model has a significant scale factor at the 0.1 percent level, with also all the estimators significant at the 0.1 percent level. As this model has an improved goodness of fit compared to the conditional logit model and a significant scale factor, this model will be used for estimating the effects of the attributes on the decision to invest.

Continues scale class model

Number of Observations	1401
McFadden R^2	0.35

	Level	Estimator	p-value	Significance	Odds Ratio
Annual project return	5%	Ref	.		
	10%	3.9222	2.30E-15	***	50.512
	15%	4.7286	4.90E-20	***	113.14
	20%	5.4967	6.40E-24	***	243.89
	25%	5.9342	6.30E-26	***	377.74
Number of years of subsidy	5	Ref	.		
	8	0.3048	0.0077	***	1.36
	10	0.7162	4.20E-10	***	2.05
	12	0.9238	2.40E-10	***	2.52
	15	1.0709	1.70E-10	***	2.92
Effect on corporate image	Neutral	Ref	.		
	Positive	0.2843	1.70E-05	***	1.33
Fluctuating fuel prices	No	Ref	.		
	Yes	-0.7373	4.90E-16	***	0.48

	Estimator	p-value	Significance
Continues scale factor	-1.2576	1.20E-17	***

Table 5 **p < 0.05, **p < 0.01, ***p < 0.001 displays significance level of z-test*

All measured attributes are highly significant in the continues scale logit model. Furthermore, the greatest effects on the decision to invest can be seen in the annual project return. Especially a project return increase from 15% to 20% gives a large increase to the likelihood that a developer will invest in RET, more than doubling of the likelihood that a developer will invest compared to 15% annual return. Also the number of years for which subsidy is available has a positive effect on the likelihood that a developer will invest in RET. However, the effect of this variable is smaller than the effect of additional annual project return. An investment with 15 years of subsidy is 2.92 times more likely to be chosen, ceteris paribus, than an investment in RET with 5 years of subsidies.

Furthermore, a positive effect on corporate image will make it 1.33 times more likely, ceteris paribus, that a developer will choose the investment over one that does not improve the corporate image. And finally, a technology that makes use of fuel of which the price is not fixed will make it 2.08 times less likely, ceteris paribus, that the developer will choose this technology over one that has fixed fuel costs.

To see whether there is an effect of the developers background on which investment will be chosen, the sector in which the investor is active will be added to the estimation. In this case, this is done by using an interaction term between the effect on corporate image and the sector in which the company is active. The resulting estimation can be seen in table 6.

Continues scale class model with effect of image per sector

Number of Observations	1300
McFadden R²	0.37

Attribute	**Level**	**Estimator**	**p-value**	**significance**	**Odds ratio**
Annual project return	5%	Ref	.		
	10%	4.2693	3.20E-16	***	71.47
	15%	5.1183	8.10E-21	***	167.05
	20%	5.8497	9.90E-24	***	347.13
	25%	6.3021	1.40E-25	***	545.72
Number of years of subsidy	5	Ref	.		
	8	0.4818	0.00037	***	1.62
	10	0.8228	1.80E-10	***	2.28
	12	1.0722	2.30E-11	***	2.92
	15	1.2256	2.00E-12	***	3.41
Image Energy Sector	Neutral	Ref	.		
	Positive	-0.1427	0.25		0.87
Image Manufacturing	Neutral	Ref	.		
	Positive	0.9379	0.002	**	2.55
Image Investment company	Neutral	Ref	.		
	Positive	-0.1405	0.3		0.87
Image Agricultural	Neutral	Ref	.		
	Positive	-0.0446	0.91		0.96
Image Supplier of renewable energy technology	Neutral	Ref	.		
	Positive	-0.1492	0.55		0.86
Image Government	Neutral	Ref	.		
	Positive	-0.3196	0.078		0.73
Image NGO or Association	Neutral	Ref	.		
	Positive	0.3715	0.031	*	1.45
Image Other sectors	Neutral	Ref	.		
	Positive	-0.5128	0.0016	**	0.60
Fluctuating fuel prices	No	Ref	.		
	Yes	-0.7721	1.20E-11	***	0.46

Table 6 *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ displays significance level of z-test*

From table 6 can be seen that corporate image improvement has a significant effect on three sectors, Manufacturing, NGO's and association, and the companies in other sectors. The manufacturing sector is 2.55 times more likely, ceteris paribus, to invest when the investment in RET has a positive effect on the company's image compared to a technology that does not have this effect. NGO and associations are 1.45 times more likely to invest, ceteris paribus, when the investment in RET has a positive effect on the company's image compared to a technology that does not have this effect. The manufacturing sector could see a positive feedback from using RET in the production of good on their corporate image and therefore gain a competitive advantage over the competition (Chen et. Al, 2006). NGO and associations are non-profit organizations, meaning they focus less on the return of projects and value other factors such as a green image more highly.

The significant negative effect seen at in companies other sectors, might be due to the fact that a number of very different companies are in this category. In addition, it is not logical that a company would be less likely to choose an investment that does not improve the corporate image over one that does. I will therefore disregard this result.

Another unexpected outcome is that agricultural companies have no significant estimator from image improvement. This is in contrast with what the interviewees argued, according to the interviewees using RET would give companies in the agricultural sector "a licence to produce".

To test whether the experience of the respondent with a particular technology has effect on investment decision, a model is estimated with a interaction effect between the annual project return and the technology with which the respondent has the most experience. Respondents that have experience with a specific technology should have different expectation of an investment compared to respondents that have experience with different technology. The resulting model can be seen in table 7.

Continues Scale Logit Model with annual return per technology

Number of Observations	1300
McFadden R^2	0.37

Attribute	level	Estimator	p-value	Significance	Odds Ratio
Garbage Annual return	5%	Ref	.		
	10%	-20.2226	0.055		0.00
	15%	1.6368	0.037	*	5.14
	20%	2.6201	0.0047	**	13.74
	25%	3.9465	0.00021	***	51.75
Biomass Annual return	5%	Ref	.		
	10%	0.9703	4.00E-05	***	2.64
	15%	1.4418	5.40E-07	***	4.23
	20%	1.795	1.30E-08	***	6.02
	25%	2.0278	1.90E-10	***	7.60
Biomass heat Annual return	5%	Ref	.		

	10%	4.4321	0.00033	***	84.11
	15%	5.4626	5.70E-06	***	235.71
	20%	5.9637	9.40E-07	***	389.05
	25%	6.3059	3.10E-07	***	547.79
Geothermal Annual return	5%	Ref	.		
	10%	2.0634	0.4		7.87
	15%	2.557	0.28		12.90
	20%	3.3782	0.16		29.32
	25%	4.1346	0.085		62.46
green gas Annual return	5%	Ref	.		
	10%	0.5072	0.027	*	1.66
	15%	0.8688	0.00067	***	2.38
	20%	1.1712	8.20E-06	***	3.23
	25%	1.4285	1.80E-07	***	4.17
Wind Annual return	5%	Ref	.		
	10%	10.4054	0.00024	***	33037.55
	15%	11.5667	6.20E-05	***	105524.67
	20%	12.1392	2.80E-05	***	187062.86
	25%	12.5343	1.60E-05	***	277700.92
Solar PV Annual return	5%	Ref	.		
	10%	3.6192	1.90E-07	***	37.31
	15%	4.011	1.60E-08	***	55.20
	20%	4.7738	1.80E-10	***	118.37
	25%	5.0316	2.10E-11	***	153.18
Number of years of subsidy	5	Ref	.		
	8	0.2601	0.00029	***	1.30
	10	0.5593	9.60E-12	***	1.75
	12	0.6116	2.90E-11	***	1.84
	15	0.7445	6.30E-13	***	2.11
Effect on Corporate Image	Neutral	Ref	.		
	Positive	0.2342	2.00E-09	***	1.26
Fluctuating fuel prices	No	Ref	.		
	Yes	-0.6592	1.10E-22	***	0.52

Table 7 **p < 0.05, **p < 0.01, ***p < 0.001 displays significance level of z-test*

The results show that the experience with a particular technology influences the level of return that is expected by the developer. Although for all technologies there is an increase in likelihood the developer will invest with increasing levels of return; there are large variations between the technologies. Developers with the most experience in wind technology are the most influenced by increases in annual project return and developers with the most experience in green gas are the least influenced by increases in annual project return. The most notable this is that developers with technologies that use biomass as fuel are the least (on average) influenced by increases in return.

Additionally, the results from the geothermal technology are not significant. This could be because geothermal technology is a technology that has many added risks. One of the respondents told me through email that he found it hard to make a decision on the given attributes without knowing the assessment of these additional risk factors.

Finally, to measure the effect of the developers background on the level of return, an interaction effect with the sector in which the developer is active and the level of annual return is included. The results of this estimation can be seen in table 8.

Continues Scale Logit Model with annual return per sector

Number of Observations	1300
McFadden R²	0.39

Attribute	**Level**	**Estimator**	**p-value**	**Significance**	**Odds ratio**
Energy Sector Annual return	5%	Ref	.		
	10%	5.415	5.70E-07	***	224.75
	15%	6.4047	4.00E-08	***	604.68
	20%	6.7982	8.80E-09	***	896.23
	25%	7.1389	2.40E-09	***	1260.04
Manufacturing Annual return	5%	Ref	.		
	10%	0.1701	0.056		1.19
	15%	0.1472	0.086		1.16
	20%	0.2286	0.0089	**	1.26
	25%	0.2995	0.0036	**	1.35
Investment Company Annual return	5%	Ref	.		
	10%	0.2897	3.70E-05	***	1.34
	15%	0.3675	2.10E-06	***	1.44
	20%	0.4536	1.40E-07	***	1.57
	25%	0.5014	6.00E-08	***	1.65
Agricultural Sector Annual return	5%	Ref	.		
	10%	-17.7231	2.90E-11	***	0.00
	15%	-21.0084	1.30E-13	***	0.00
	20%	-22.7634	8.20E-15	***	0.00
	25%	-23.995	1.60E-15	***	0.00
Supplier of renewable energy technology Annual return	5%	Ref	.		
	10%	3.9132	0.0033	**	50.06
	15%	4.6172	0.00079	***	101.21
	20%	4.9655	0.00034	***	143.38
	25%	5.2062	0.00022	***	182.40
Government Annual return	5%	Ref	.		
	10%	1.1356	3.50E-05	***	3.11
	15%	1.3422	4.90E-07	***	3.83
	20%	1.5747	2.80E-07	***	4.83
	25%	1.79	1.50E-07	***	5.99
NGOs or association Annual return	5%	Ref	.		
	10%	0.9805	0.01	**	2.67
	15%	1.4732	7.30E-05	***	4.36

	20%	1.9015	1.50E-06	***	6.70
	25%	1.9394	1.30E-06	***	6.95
Other sectors Annual return	5%	Ref	.		
	10%	5.8189	0.001	***	336.60
	15%	6.6564	0.0004	***	777.75
	20%	6.8412	0.00029	***	935.61
	25%	7.1196	0.00018	***	1235.96
Number of years of subsidy	5	Ref	.		
	8	0.0191	0.33		1.02
	10	0.1231	7.00E-06	***	1.13
	12	0.1467	2.00E-06	***	1.16
	15	0.1921	1.30E-06	***	1.21
Effect on Corporate Image	Neutral	Ref	.		
	Positive	0.0845	2.30E-06	***	1.09
Fluctuating fuel prices	No	Ref	.		
	Yes	-0.2915	8.50E-11	***	0.75

Table 8 *$*p < 0.05$, $**p < 0.01$, $***p < 0.001$ displays significance level of z-test*

Increased annual project return has a significant effect on almost all of the sectors, the most significant effects can be seen in the energy sector and with the suppliers of renewable energy technology. These two sector have extremely high odds ratios. The least significant effects can be seen in the manufacturing industries. The reason for the large estimators in the results for the energy sector can be due to the corporate structure of these companies. Companies in the energy sector are often larger companies, in addition they are often publicly traded. Meaning that next to being profit orientated, they often need a minimum return on investment to satisfy shareholder.

Companies in the manufacturing industry as shown in table 5 above, showed a large significant effect when it comes to improvement of corporate image and the likelihood that they will choose an investment. Table 8 shows that the likelihood that manufacturing companies will invest at higher levels of return is much smaller compared to other sectors in the sample. For example, manufacturing companies are only 1.26 times more likely, ceteris paribus, to choose the investment with 20% annual project return over an investment with 5% annual project return. Compared to government institutions that 4.83 more likely to choose the investment with 20% annual project return over an investment with 5% annual project return. This could mean that companies in the manufacturing sector value corporate image improvement more than additional annual project return, e.g. because corporate image improvement gives them a competitive advantage (Gray & Balmer, 1998; Chen et al. 2006).

The agricultural sector shows a negative significant effect when it comes increases in annual project return and the likelihood that these companies will invest in RET. This result seems highly unlikely. As mentioned above the response rate from the agricultural sector was very low. This for a large part could explain the unusual outcome. In addition, it might be the case that respondents from active in the agricultural sector felt they did not have enough information to answer the questions accurately, as one of the respondents informed me through email.

The results of the other sectors vary between odds ratios of 1.65 for the investment sector at the low side and 6.95 for NGOs and association at the high side.

The results show that some sectors have different drivers when it comes to investment decisions. Companies with a background in manufacturing value investments more highly, that have a positive effect on the corporate image. At the same time they value annual return less highly than companies in other sectors do. Additionally, large differences can be seen between technologies. Developers that have experience with technologies that have zero marginal costs value annual return more highly than developers that have experiences with technologies that do have marginal costs, such as biomass.

7. Conclusion & Discussion

This research found that for the largest part developers are influenced by the level of return when making a decision to invest, followed by the level of risk associated with this investment. However, the degree to which the developers are influenced by these attributes varies with investor background. The results show that some sectors see a much larger effect from extra return on their decision to invest than other sectors. For example, organizations that are active in the energy sector attach more value to extra return than government institution or NGOs and associations. To some extent this is expected as, organizations that are active in the energy sector, are often larger companies and in addition they are often publicly listed. Meaning that they often will invest in larger projects which increases the financial risks. Furthermore, these companies often require a minimum level of return to satisfy shareholders. The results also show that organizations that are active in the manufacturing industry attach less value to additional return when making investment decisions. Moreover, this group of organization attaches more value corporate image improvement than organizations do in other sectors, when making investment decision in RET. This can be due to the fact that organizations in this sector can see an increase their competitive advantage by adopting RET, as they can communicate a favorable corporate image (Chen et. al, 2006).

As a result I can conclude that developers background can partly explain the drivers behind investments in RET. Additionally, I can confirm that most developers are largely driven by policy attributes such as return on investment. Furthermore, I can confirm that also minimizing risk plays an important role for many developers when choosing an investment.

Theoretical implications

This research filled the gap in the currently available literature, which currently only analyses RET investments on a purely techno-economic basis. Other authors have also argued that an analysis on purely techno-economic basis is insufficient to explain RE investments fully (Masini & Manichetti, 2013). This research, in addition to techno-economic drivers, also looked at background and experience of the developer. This research shows that to some extent these factors influence developers investment decisions. The developer's background, measured as the sector in which they are active, can to some extent explain the drivers behind his investment decisions in RET. For example, developers in the manufacturing sector are more likely to choose a technology that has a positive effect on their corporate image. As compared to developers that are active in energy sector, these developers are more driven by project return above other things.

In addition this research also confirmed that developers are mainly influenced by risk and return as found by e.g. Bürer and Wüstenhagen (2009). Developers will more likely choose an investment with a lower risk and a higher return. However, the degree to which developers are influenced by risk and return depends on what sector the developer is active in. Next to this, the experience of a developer with a certain technology can influence the degree to which they value project return. This is in line with what was argued by Wüstenhagen & Teppo (2006), they argued that perceived risk and return are often related to experience of the investors. For that reason they argued in their case that investors that have not previously invested in RET will value conventional technology more highly because of their previous experiences with this technology. In this case developers adjust their return expectations to the technology they have the most experience with.

Practical implications

The main practical implication of this paper is that institutions that develop RE subsidies should look beyond risk and return. Masini and Manichetti (2013) have argued that many policies fail to achieve their goal, because of a mismatch between drivers behind investment decisions and the policy in instruments. As a result of the findings of this paper institution should take into consideration developers backgrounds when developing policy, in addition to the risk and return assessment. This means that subsidy policies should be adjusted to what kind of investors or developer the policy wants to attract. Langniss (1996) has shown that different types of support will attract different kinds of investors. This indirectly means that the funds will come from investors with different backgrounds, depending on the type of subsidy. By creating subsidies that are more adjusted to the investors background, the effectiveness of attracting this specific kind of investor will increase. Hence, increasing the probability that the subsidy policy will achieve its goal. Customizing the subsidy to a particular background can also be useful when a particular group of developers is a specific target of government incentives for RE. As a result, less subsidy may be needed to achieve the goal of policy. Resulting in a more effective deployment of government funds. Additionally, subsidy policies should not only be evaluated by measuring in how far they achieved their goal, but also whether the subsidy attracted the investor with the right background. Future research could look at different subsidies for RE and relate that to the background of the investors the subsidy attracted.

Limitations

This research contacted companies based on SDE+ application data from the RVO, together with internet searches for energy funds, NGOs and companies active in energy intensive industries. This resulted in a sample of both companies that did not previously apply for subsidy and companies that did previously apply for SDE+ subsidy. The majority of companies that were contacted however had previously applied for SDE+ subsidy making them more prominent in the sample. This could limit the generalizability of the study towards companies that have previously applied of SDE+ subsidy.

In addition, it should be noted that this research took place in the Netherlands among people active in the renewable energy sector with knowledge of the SDE+ subsidy. This might put a limitation on the external validity. As a result, this study might only be generalized to other countries to a limited extend as differences at the level of the subsidy itself may be present. But also differences at the level of the legal system between countries might exist, hence creating different kinds of risks not captured by this model. An example of a different legal system could be the administrative burdens, which according to Lüthi & Wüstenhagen (2012) could have an effect on investment decisions. Future research could focus different countries or multiple countries to see whether the developers background also there has an influence on the investment decision.

Most of the respondents in the sample had experience with photovoltaic technology the results of this research could therefore be skewed towards this technology. Around 50% of the respondents indicated that they had the most experience with photovoltaic technology, meaning that a rather large part of the results is based on this technology. Which may not necessarily be in line with other technologies. Furthermore, although the agricultural sector is one of the sectors that applies most for SDE+ subsidy, their response rate proved only to be around 2%. In addition, the results of this sectors were not consistent, this makes it difficult to say if the larger results of this study are also generalizable to this sector. Future research could focus more specifically on this sector, as it is a sector with a high energy usage but also a sector which at the same time has the means and resources, such as large roof tops for solar and biomass waste products, to effectively implement RETs.

To improve the internal validity of this research, the choice experiment were kept as close as possible to real life scenarios. This means that the levels of the attributes were based on levels that companies could expect to find in real life scenarios. The qualitative pre-study was used to establish how companies measure the attributes of project returns, subsidy periods, image improvements and fluctuating fuel prices. This should have allowed respondents to relate to the choices that they were given in the experiment. However, one of the limiting factors of this research is that it cannot capture additional factors such as cleanup costs of some technologies, or risks such as failed drilling hole for geothermal plants. These can often form a large part of the costs and developers won't invest without knowing these factors in advance. Therefore for some developers it is impossible to make a "real world" decision based on the given attributes, as some of the respondents also informed me through email. Future research could focus on these specific technologies, such as geothermal, that have larger technologies risks than other technologies under the SDE+.

Limited availability of funds

In a recent evaluation of the SDE+ subsidy. Researchers concluded that some investors especially in the "free category" (for a detailed explanation look in CE Delft (2016)) are deterred from investing with SDE+ subsidy because of the limited availability of funds (CE Delft, 2016). Most of the applications for the subsidies in these categories are for technologies that are more experimental. This research did not focus on the availability of funds as the interviewees did not see this as a problem. The reason behind this is, they argue, that most applications are done by consultants that offer to do all the application work for free if the application is not accepted. However, due to the limited size of the interviewee sample it could be the case that other companies do see this as an issues when considering an investment in RET. Future research could include attributes that focus on the availability of funds in order to establish to what extent this influences developers decisions to invest.

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Appendix A

Interview Questions

Dimension	Attributes	Question
(Introduction)		In dit interview zal ik u vragen naar uw afwegingen bij het maken van investeringsbeslissingen in energietechnologie en de rol die de SDE+ subsidie hierin speelt. Ik ben daarnaast benieuwd naar hoe een aantal factoren jullie investeringsbeslissingen beïnvloedt. Deze factoren zijn vooral gerelateerd aan de verschillende aspecten van de SDE+ subsidie. Aan het einde van het interview zal ik u vragen of u nog iets wilt toevoegen aan het gesprek en of er misschien onderwerpen niet aan bod zijn gekomen.
SDE+ Case specific		• Als u een investering gaat maken welke aspecten tellen voor u het zwaarst in de afweging tussen verschillende investeringen? • Waarom wegen deze mee? • Wat zijn de verschillen van een normale investering en een investering met SDE+ subsidie? • Wat zijn de voornaamste redenen om niet te investeren in technologie on de SDE+? • Zijn dit redenen om eerder voor een investering in conventionele technologie te gaan?
Administrative Process	Administrative Period	• Hoe ervaart u de procedure waarmee de SDE+ subsidie moet worden aangevraagd? • Nadat u de subsidie hebt aangevraagd, hoe lang duurt het voordat u te horen krijgt of u een subsidie krijgt toegewezen? • Wat vindt u van de lengte van deze periode? • Hoe lang is het hele traject, van voorbereiding tot goedkeuring? • Is deze periode langer dan bij conventionele technologie? • Welk deel van de aanvraag duurt naar verwachting het langste?
	Administrative Requirements	• Is het moeilijk voor uw bedrijf om aan alle voorwaarden voor een SDE+ aanvraag te voldoen? • Tegen welke moeilijkheden loopt u aan tijdens een SDE+ aanvraag? • Heeft u kennis van buitenaf nodig om SDE+ aanvraag te kunnen doen? • Hoe ervaart u de verplichte haalbaarheidsstudie? • Worden de vereisten voor de aanvraag duidelijk gecommuniceerd?
Funding	Ease of finding funding	• Moet u veel moeite doen om financiering te vinden? • Bij welke technologie is het makkelijker om financiering te vinden? Conventioneel of hernieuwbaar met SDE+ subsidie?

		• Hoe belangrijk is het om makkelijk financiering te vinden voor de investering in de overweging bij het kiezen tussen hernieuwbaar en conventioneel? • Zoekt u financiering van buitenaf bij investeringen in energie projecten? • Moet u veel data overhandigen om aan de financiering te komen? • Bij welke partijen gaat u meestal op zoek naar financiering? • Hoe lang duurt het meestal tot u financiering voor uw project heeft gevonden?
	Amount of funding	• Voor welk aandeel van een project onder de SDE+ zoekt u financiering? Kunt u dit in een percentage uitdrukken? • Als u financiering vindt voor een project is dit dan vaak gelijk aan het gedeelte waarvoor u de aanvraag deed? • Moet u veel garanties geven voor de financiering van een project?
Risk and Return	Level of Return under SDE+	• Is het rendement dat u uit een investering in nieuwe energie technologie behaalt van belang (conventioneel dan wel hernieuwbaar)? • Is het rendement dat kan worden behaald door een investering met SDE+ subsidie voldoende om deze te overwegen? • Is het rendement dat u behaald onder de SDE+ subsidie hoger dan het rendement dat u verwacht bij conventionele technologie? • Als u ondanks een hoger rendement toch niet zou kiezen voor een investering met SDE+ subsidie wat zou hiervoor dan de reden zijn?
	Level of Risk under SDE+	• Hoe ziet u het financiële risico van een investering onder de SDE+ regeling? • Ziet u het feit dat het om overheidssubsidie gaat als een toegevoegd risico? Of juist een vermindering van het risico's? • Welke financiële risico's voorziet u bij projecten die onder de SDE+ vallen?
(Conclusion)		• Zijn er volgens u nog meer aspecten die betrekking hebben op de SDE+ regeling die meewegen tijdens een investeringsbeslissing? • Welke? Waarom wegen deze mee? • Zijn er dingen die u over dit onderwerp wilt zeggen die nog niet naar voren zijn gekomen in dit interview?

Table: Interview Questions