MASTER

The commercialization of PV systems in Flanders
the interaction between legislative changes and business model development

van Rijn, M.L.B.

Award date:
2013

Master thesis: Innovation Management

The commercialization of PV systems in Flanders :

The interaction between legislative changes and business model development

Author: M.L.B. van Rijn (0739645)

First supervisor: dr. K.S. Podoynitsyna
Second supervisors: J.C.C.M. Huijben, MSc &
dr. G.J.P. Verbong
Company supervisor: J. Lemmens, Msc

Department: Innovation, Technology, Entrepreneurship and Marketing

Date: 20-03-2013

Management summary

Nowadays the new sustainable energy technologies generate a disappointing 3% of the world's total energy production (IEA.org, 2013). A positive note to this is the increased growth percentage over the last years. Particularly in the solar energy or PhotoVoltaics (PV) market an interesting growth spurt can be observed. This proven technology has by far the largest potential in the development towards a complete sustainable energy provision (Huijben and Verbong, 2012). But the major problem with the diffusion of the renewable energy technologies is still the financial feasibility of the projects (Ambec and Lanoie, 2008).

A number of European countries provide a progressive policy to stimulate the diffusion of PV systems into the conventional energy market. This resulted in large growth of PV systems in the market. The worlds cumulative solar PV electricity capacity just surpassed the 100 GW in 2012 and the total capacity more than doubled compared to the situation in 2010 (EPIA.org, 2013). The Flemish part of Belgium represents the second largest part of the European market and has been observed as one of the fastest growing markets in Europe over the last years, in particular from 2006 till 2012 (EPIA.org, 2012).

Numerous organizations and initiatives entered the booming market to participate in the commercialization of PV in Flanders. For a smooth diffusion of PV systems in the market several influencing factors are observed. In general these factors can be classified in two main categories (Schleicher-Tappeser, 2012). The first influencing factor is the developments of the regulatory system. The second factor is the ability of the market players to develop and adapt appropriate business models for a specific situation in which the organization is acting (Schleicher-Tappeser, 2012). This factor depends on the skills of the company that deals with the changing environment and the need to adapt their business model to these circumstances. Therefore within this research project the following question were therefore stated:

- *How did the legislative changes interact with business model development from 2006 till 2012?*

The following definition of a business model is used for the research:

> *"A business model describes the rationale of how an organization creates, delivers, and captures value"(Osterwalder and Pigneur, 2010)*

The use of an innovative business model helps organizations to adapt to the changing environment in which the organization is acting. An innovative business model is a model which creates a new market or allows a firm to develop and exploit new opportunities in existing markets Zott and Amit (2010). The two methods of Osterwalder and Pigneur (2010), and the Board of Innovation (2012), are consulted for this research project. The methods helped to structurally map the various business models in Flanders. With the help of various interviews the business models in Flanders were mapped and described. The possibilities for the development of the various business models was influenced by legislative changes. The legislative changes in 2006 caused shifts in the balance of the market and

therefore created a source of opportunities in the Flemish market (Eckhardt and Shane, 2003). Organizations can react to these new opportunities by innovating business models to expand their potential markets. The origin of the opportunities is heavily discussed in the ongoing debate of opportunity creation versus opportunity discovery (Renko et al., 2012). All the developments in legislation provide a non-transparant dynamic market but provided an interesting research area.

After mapping the various legislations concerning the PV market the most obvious observation was the large number of regulations in place, more than 20 different regulations reflect were found. This was mainly caused by the disseminated responsibilities by the division in the regions. The complicated structures and controversial interest of the different governmental layers caused some difficulties in the market. Another main finding was the presence of an over-subsidy in the Flemish market (i.e. higher PV electricity price was over compensated). This over-subsidy was mostly caused by the high compensation for the Green Certificates (GSC) mainly in between 2008- 2011. The policy concerning the GSCs was also inconsistent over the years and therefore caused a lot of confusion in the market. This inconsistency is one of the main frustrations for investors and other stakeholders in the market and is mentioned as the main obstruction for further development in the market. It was obvious that the various regulations influenced the Flemish solar energy market.

To be able to observe the actual impact of the regulations on business model development in the market, the different business models were mapped. The different business models in the Flemish market are mapped using the model of Schoettl and Lehmann-Ortega (2010) (see Figure 1). The figure helped to distinguish and visualize the various business models in the market. With the help of the same figure three snapshots of the Flemish market were made.

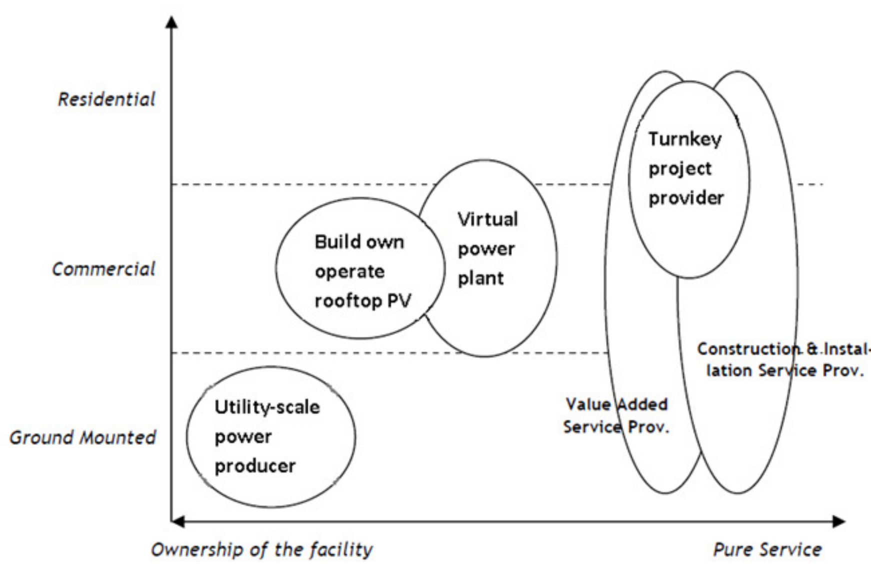


Figure 1 The six generic business models by Schoettl and Lehmann-Ortega (2010)

The visualization helped to recognize various patterns in the development of the business models over time. In general there were three main observations: several business models were applied within a single organization; market activities and focus changed over time; and different business goals cause deviation in opportunities of business model development. The three figure composed for the Flemish market varied to a large extend from the original figure by Schoettl and Lehmann-Ortega (2010). Most distinctions were found in the size and the addition of one extra circle. The “seventh” generic business model is called the Additional model. Within the seventh generic model the PV systems are provided in addition to another product. The development of the business models was influenced to a large extend by the legislative changes.

The following division of the governmental regulations is observed: Compensation for the green certificates; Quota obligations; and Subsidies and taxation. The division of governmental regulations is extracted from the article of Ayoub and Yuji (2011). One of the main legislative changes of influence to almost every business model is the GSC mechanism. The GSC mechanism, implemented in 2006, is observed as the main motivation of the creation and the rise of the different business models. Directly after the implementation of the GSC mechanism the rise of several business models was observed. After the decreased compensation of GSC the organizations active in the commercial and ground mounted market changed their orientation to the smaller systems (<10 kW). The organizations previously focused on large systems exceeding 250 kW because they were able to receive the largest profits with these project. Besides the adoption pace of the to the GSC mechanism causing fast approaching deadlines, the unpredictable and fluctuating regulations concerning the GSC and other regulations influenced the market drastically. The various organizations within the market were hardly capable to adapt to the changing regulations. Since 2012 the market potential diminished because of the changing regulations and the lack of the organizations to adapt their business models to the developed circumstances. Also various institutional boundaries to business model development were observed in the market. The boundaries were mostly caused by the complicated governmental structures present in Belgium. Due to the unpredictable legislative changes the different organizations in the Flemish market explained to wait until these legislations will be more clear.

The following overall conclusion can be stated about the Flemish PV market. The Flemish government created an artificial flourishing market with the generous GSC mechanism. The mechanism caused shifts in the balance of the market and is therefore recognized as the main source of opportunities; no further opportunity creation was observed. On the short run the organizations applied business models were the ownership of the facility shifted towards the organization instead of the customer. In the long run the organizations were not further stimulated to develop creative business models to help to overcome financial barriers, due to the presence of over-subsidy. The GSC compensation decreased in a rapid and unstructured pace, this caused a major downfall in the business activities and the opportunities of business model development. Numerous regulative restrictions to developed business model were observed in the market. These findings underpin the influencing factors to the commercialization of renewable energy by Schleicher-Tappeser (2012), the motivator of the research. Diffusion of PV in the Flemish market is influenced by the ability of market players to develop and adapt appropriate business models for a specific situation in which the organization is acting, and the potential developments of the regulatory system.

Table of Contents

Chapter 1. Introduction

1.1 Problem definition

Since the early 90s commercial developments within the renewable energy sector started resulting in a broad spectrum of technologies (Pinkse and van den Buuse, 2012). The developments were initiated by the global increased awareness of the current energy systems being unsustainable. The generation of energy with conventional technologies has numerous downsides: one of the main causes of air pollution; depletion of the resources; and the resources are unevenly distributed (Huijben and Verbong, 2012). Therefore, the stimulation of sustainable energy production is highly prioritized.

The new sustainable energy technologies nowadays generate a disappointing 3% of the world's total energy production (IEA.org, 2013). A positive note to this is the increased growth percentage over the last years. Particularly in the solar energy or PhotoVoltaics (PV) market an interesting growth spurt can be observed. This proven technology has by far the largest potential in the development towards a complete sustainable energy provision (Huijben and Verbong, 2012). But the major problem with the diffusion of the renewable energy technologies is still the financial feasibility of the projects (Ambec and Lanoie, 2008).

A number of European countries provide a progressive policy to stimulate the diffusion of PV systems into the conventional energy market. This resulted in large growth of PV systems in the market. The worlds cumulative solar PV electricity capacity just surpassed the 100 GW in 2012, the total capacity more than doubled compared to the situation in 2010 (EPIA.org, 2013). Europe contributes for 60% to the global cumulative installed capacity. A number of interesting European PV market markets can be put forward. The German, Belgian, Italian and Czech republic are responsible for the largest electricity production per inhabitant produced by PV (see Figure 2). Belgium represents the second largest part of the European market and is recognized as one of the fastest growing markets in Europe over the last years (EPIA.org, 2012). The PV market represents the largest growing sustainable energy market in Belgium nowadays (VREG.be, 2012). The Belgium market in general is in many ways complicated and differentiated from the situation in most countries. The main reason for this complicated situation is the division of the federal state of Belgium in three regions; Flanders, Wallonia and Brussels. The partition causes a division in legislative developments and responsibilities on the various levels. The regions separately developed supporting mechanisms what caused differentiated growth markets between the regions. The Flemish market makes up 85% of the total market in 2012, and the majority of the systems are installed the residential segment (epia.org, 2012). Therefore this research project will focus on the Flemish PV market.

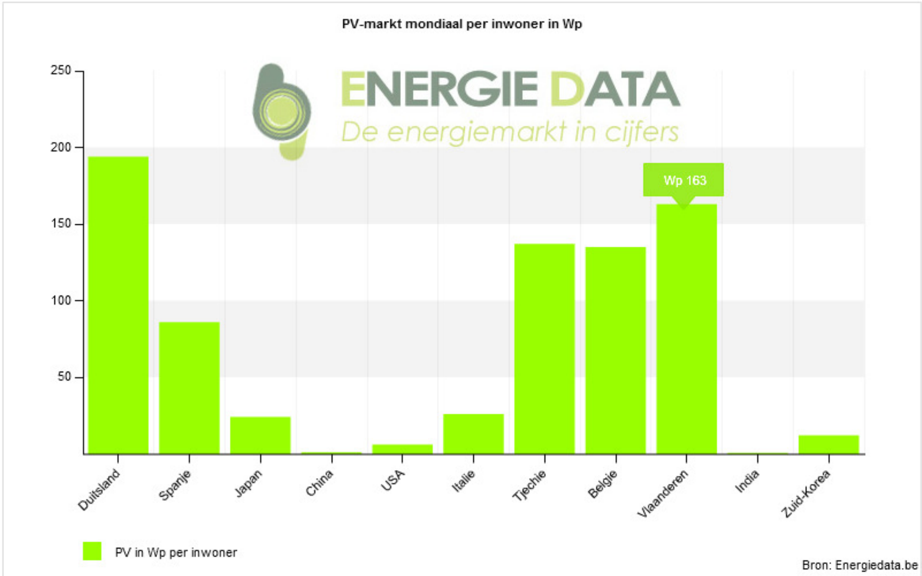


Figure 2 Photovoltaic power per inhabitant for big players in the market (in Wp/inhab)(Energiedata.be, 2012).

To observe the developments of the Flemish market a certain time frame needs to be chosen. The frame has to cover the developments in legislation with the largest impacts on the commercialization of the PV systems in Flanders. Figure 3 shows the number of PV systems in the Flemish market, an exponential growth spurt can be observed starting in 2007. Therefore a time frame of six years is chosen to include the developments prior to the growth spurt. Therefore the research will observe the Flemish market concerning the innovative business models and the changed legislative conditions in a six years period from 2006 till 2012.

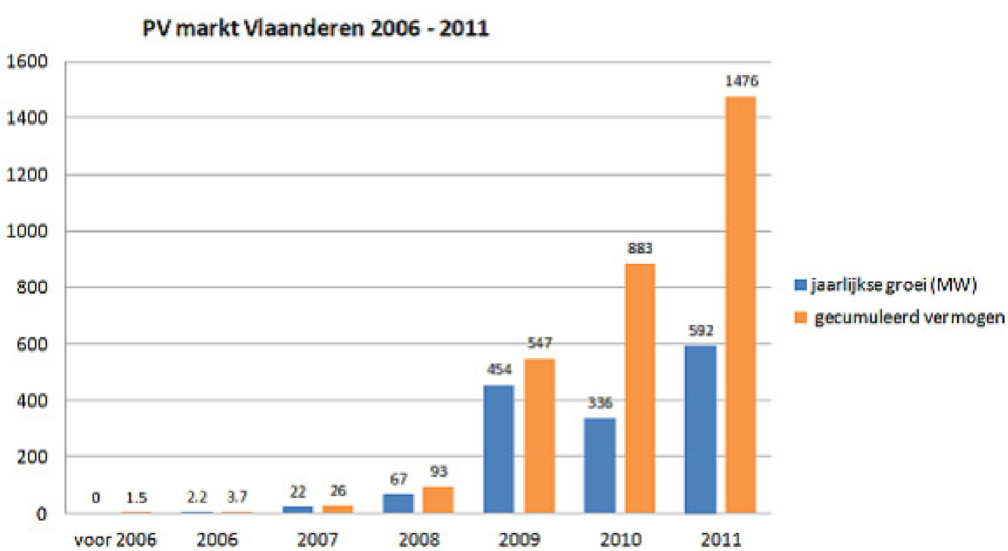


Figure 3 Market growth PV in Flanders (ODE.be, 2012).

With the help of the supporting mechanisms the major growth numbers of Figure 3 were realized. Numerous organizations and initiatives entered the booming market to participate in the commercialization of PV in Flanders. For a smooth diffusion of the PV systems in the market several influencing factors are observed. In general these factors can be classified in two main categories. The first influencing factor is the potential developments of the regulatory system (Schleicher-Tappeser, 2012; Provance et al., 2011; Burer and Wüstenhagen, 2009). Within this research project the terms regulations and legislation will be used describing the same matter. Policy is the strategy of a government with the help of one or several regulations. The second factor is the ability of the market players to develop and adapt appropriate business models for a specific situation in which the organization is acting (Schleicher-Tappeser, 2012). The following definition of a business model will be used in this research project: A business model describes the rationale of how an organization creates, delivers, and captures value (Osterwalder and Pigneur, 2010*).* A business model cannot be static they need to develop over time to be able adapt to environmental changes (Gunzel and Wilker, 2009). This factor depends on the skills of the company who deals with the changing environment and the need to adapt their business model to these circumstances.

For the stimulation of the diffusion of PV systems in Flanders different support mechanisms are applicable, including both green certificate schemes (GSC) and net metering for systems below 10 kVA (EPIA.org, 2012). Other support mechanisms where provided by regional subsidizing and a tax advantage for the purchase of the systems. The legislation for these support schemes is constantly changing, for example the tax advantages were completely be removed per 2012. The regulation interventions can be seen as a source of opportunities as observed by Eckhardt and Shane (2003). Organizations can react to these new opportunities by innovating business models to expand their potential markets. The origin of the opportunities is heavily discussed in the ongoing debate of opportunity creation versus opportunity discovery (Renko et al., 2012). All the developments in legislation provide a non-transparant dynamic market but an interesting research area.

The PV market is a diverse market with many stakeholders involved in the entire value chain. This PV value chain can be divided in three main areas: the *Upstream, Downstream* and the *Ownership and Operation* part of the chain (see Figure 4). Because of standardization of manufacturing of the systems and the competition from China, the opportunities for the upstream players are reducing. Downstream players are mentioned to have the largest potential and investments shift from the manufacturers to the companies focused on the development of innovative downstream business models (Aanesen et al., 2012). The sale of the PV systems into the market starts in the Downstream and Ownership and Operation section of the supply chain. In this section of the supply chain most creative solutions to commercialization are constructed. Frantzis et al. (2008) confirm the importance of this section of the supply chain to business model development, they state that the different models of systems operation and control occur in this section. The higher potential of the occurrence of new business models in this section of the supply chain explains the focus of this thesis to be on this Downstream and Ownership & Operation section. In figure 3 this part of the value network is shown, including the stakeholders involved in this section (Frantzis et al., 2008).

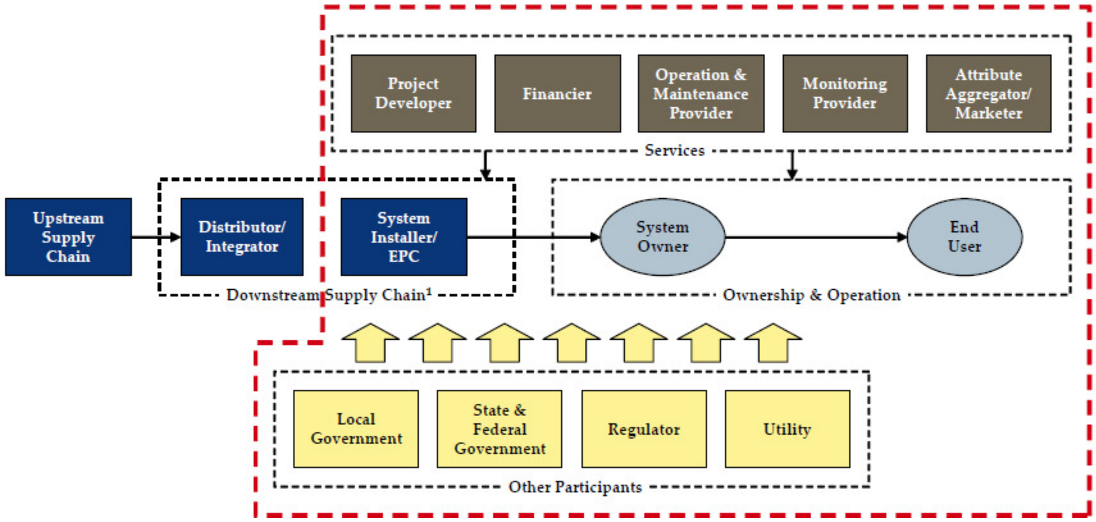


Figure 4 PV product supply chain and value network (Frantzis et al., 2008)

1.2 Research questions

Based on the above described problem definition the main research question for this research project has been composed:

- *How did legislative changes interact with business model development from 2006 till 2012?*

The following sub questions are composed to support this process and provide complementary information during the research:

- *Which types of business models have been applied in Flanders for the commercialization of PV systems?*
- *How did the legislation within the PV sector develop over time?*
- *How are these changes in legislation achieved, where they influenced by players in the PV market?*
- *Is there a connection observable between both developments?*

With the help of the constructed research questions a final overview of the Flemish PV market is provided as outcome. In the next chapter the theory concerning the three main subjects; namely business model innovation, legislation and opportunities, will be further discussed.

1.3 Thesis outline

Within the next Chapter 2 the theoretical background will be discussed, to continue with the methodology of this research project in Chapter 3. In the chapters 4 and 5 the various actors in the market and the legislative developments will be discussed. In Chapter 6 the various business models will be mapped and the interaction between the legislative changes and business models observed. The last Chapter 7 will provide the final conclusion and the future prospects to the research project.

Chapter 2. Theory

As discussed in the introduction, there are two main factors that have an impact on the commercialization of renewable energy (Schleicher-Tappeser, 2012). The first factor is the ability of the organizations to develop and adapt appropriate business models for the specific situation in which the organization is acting (Schleicher-Tappeser, 2012). The impact of this factor depends on the ability of the company to adapt their business model to these changing circumstances. The creation of an applicable business modeldepends on a number of different factors. In the following paragraphs the theoretical background of the use and development of business models will be further discussed. The second factor, the potential developments of the regulatory system, is the external factor that influences the diffusion of renewable energy technologies in the market (Schleicher-Tappeser, 2012). The external factor depends too a large extent on governmental decision making and corresponding policies. Therefore it is hard for the single organization to influence this factor. The impact of the external factor depends on the approach of the organization to respond to the developments. The two above mentioned factors are broadly discussed in the following chapter. The first part will concern the theory of the business models. The second part will discuss the external factors.

2.1 Business Models

As mentioned in the introduction, the design of a suitable and applicable business model has a large impact on the commercialization of sustainable energy technologies (Wüstenhagen and Boehnke, 2006). With the help of new innovative business models, the barriers to commercialization of renewable energy and therefore PV systems can be overcome and a smoother diffusion of the technology in the market can be facilitated (Schleicher-Tappeser, 2012). Within every company, either explicit or implicit, a particular business model is employed. This model is not particularly described on paper but is the manner in which the company will be able to receive a positive outcome of the offered product or service. Business models have always been an element of an organization, but the use of the models has changed over time. Fomerly, the patterns of the business models were noticed after the implementation. An example of this situation is when after the launch of a product, the observation showed that another approach would have been more appropriate. Nowadays, the business models are developed before the launch, just like the market research. In this way, companies are able to link the market assumptions to their business model. By linking the assumptions, like predictions of customer behavior, to the numbers of for example profits and losses, the best fitting business model can already be created before the launch of the product or service (Magretta,2002).

Traditionally, the revenue model was solely used to capture the value from a developed product or service. In this model the consumer pays for the products or intellectual property which is owned by the company which provides (Teece, 2005). Nowadays business models and their revenue models are widely innovated to receive the ultimate profit from the delivery of the service or goods. The applied constructions go far beyond the traditional ones. Innovative manners and constructions are developed to improve commercialization and the financial efficiency. The incentives of these innovative constructions are mostly caused by the changes in global economy, and thereby the balance between customer and supplier. The renewed communication (denk ik?) opportunities, improved technologies, and globalization of the trade market offers customers a diverse range of choices. Due to these changes the innovations in business models are heroic. Without these developments the rewards for pioneering individuals, enterprises and nations cannot be gained (Teece, 2005). Within the business model literature there is an enormous diversity concerning the definition of business models. In the following paragraph (2.2.1) one preferred definition is chosen. This definition will be used in the rest of the literature study. After the specification of the definition, the importance of the business model innovation and mapping will be discussed. The last section of this chapter (2.5) will concern the impact of the external factors to the development of these business models.

2.2 Definitions of Business Models

Since the introduction of the term "business model", the literature published an enormous amount of explanations to clarify the meaning of this term. The use of the term within managerial literature experienced its major flourish in the dot-com boom during the late 90's (Demil and Lecoc, 2010; Gunzel and Wilker, 2009). This can be explained by the fast adoption of internet in (in wat?) and corresponding the e-commerce, resulting in strong globalization of the market. Both boosted the diffusion of business models across geographical boundaries, and therewith also the availability of private capital for a spur in the development of new innovative business models (Hamermesh et al., 2002; Demil and Lecoc, 2010). These developments resulted in lots of elaborated explanations about the term "business model", which were constructed and published by various business experts and academics over the last years. Most academic research about business models has been performed in the field of e-business, which is mainly focused on new ways of doing business in this branch. However, also in this sector, there is still no consensus about a generally accepted definition (Malone et al., 2006; Gunzel and Wilker, 2009).

Each definition in the literature has a specific focus with various characteristics and is therefore likely to form a changing set of classes and the possibilities of classification (Baden-Fuller and Morgan, 2010). However some patterns are noticeable. Diverse selections of definitions show a more abstractive description with the focus on business networks. Other definitions are formulated into more detail and describe all business functions. An explanation for these differences is the manner in which the business models are intended to be used (Gunzel and Wilker, 2009). The intention of the model is important for the optimal applicability. Therefore the implementer needs to understand the term but also know how to identify, assess and create the model (Hamermesh et al., 2002). The first step for the realization of the understanding of the model?, is to create a general accepted explanation for the term business model. The importance of understanding the explanation, is also underpinned by Magretta (2002) who states:

"A good business model remains essential to every successful organization, whether it's a new venture or an established player. But before managers can apply the concept, they need a simple working definition that clears up the fuzziness associated with the term"

In Table 1, a number of explanations of the term are shown. This is obviously just a small selection of the available explanations. Even though the existence of this different set of classes between the definitions, a number of similarities can be observed. These similarities are highlighted in Table 1, in order to choose one overarching definition that will be used in the rest of the study.

Table 1 Definitions of Business Models

Author	**Definition**
Teece	"A business model articulates the logic and provides data and other evidence that demonstrates ***how a business creates and delivers value to customers.***"
Amit and Zott	"A template how a firm links factor and product markets to ***deliver value to stakeholders."***
Osterwalder and Pigneur	"A business model describes the rationale of how an organization ***creates, delivers, and captures value.***"
Demil & Lecocq	"The business model concept generally refers to the articulation between different areas of a firm's activity designed to ***produce a proposition of value to customers***."
Baden-fuller and Morgan	"The role of business models is to provide a set of generic level descriptors of ***how a firm organizes itself to create and distribute value*** in a profitable manner."
Johnson et al.	"The business model ***takes together, creates and delivers value.***"
Wirtz	"A business model reflects the operational and output system of a company, and as such ***captures the way the firm functions and creates value.***"
Schoettle and Lehman-Ortega	"A business model depicts the mechanism that enable a firm to ***create value trough the value proposition to its potential customers, its value constellation, and how it captures this value to transform it into profits.***"

When observing the different definitions in table 1 the word "value" is always highlighted. The different words prior to "value" explain the manner how the value is achieved, created, captured and delivered. This is most in line with the definition of Osterwalder and Pigneur (2010). Therefore the following definition is adopted in the rest of this study:

"A business model describes the rationale of how an organization creates, delivers, and captures value."

As discussed in the introduction, business model innovation is a useful approach to improve the feasibility of a smoother diffusion of sustainable energy in the market. The importance towards business model innovation are therefore further discussed in the following section.

2.3 Business Model Innovation

Business models are acting in a continuous changing environment and therefore a process of development and adaption is necessary to realize the best outcome of the model. By innovating the business model the organization is able to respond to changes and adapt their model. In this paragraph the importance of business model innovation is further explained.

2.3.1 The importance of business models innovation

The use of an innovative business model helps organizations to adapt their models to the changing environment in which the organization is acting. An innovative business model is a model which creates a new market or allows a firm to develop and exploit new opportunities in existing markets (Zott and Amit, 2010). The process of business model innovation helps the organization to observe changes and apply new approaches to improve the competitive advantage. The innovation of a business model is performed by improving and changing the manner in which the value creation is realized. This is to accomplish an increased profit equation. For example, by the creation of new connections between parties, between transaction participants or by the introduction of new transaction mechanisms (Zott and Amit, 2010). Gambardella and McGahan (2010) devote the success of ICT and Internet companies to the specific skill of innovating the business model. They also state that those success stories have influenced and spurred firms in different fields to adapt their business models to their own new opportunities. The increased importance of such adaptations is mostly caused by the globalization and the resulting growth of alternative products because of this globalization.

The process of business model innovation helps companies to create insights to innovate in markets where competition has not occurred yet. After the development of a proper new model, which influences strategic position of the company in the market, the model becomes more difficult to replicate which creates a stronger competitive advantage (Margretta, 2002). This provides a more sustainable advantage for the company over time. Zott and Amit (2010) state that business model innovation assists companies to stay ahead in the product innovation game, or as one CEO, said,

> *''You are always one innovation away from getting wiped out by a new competing innovation that eliminates the need for your product"*

A good fit between the organization and the newly developed business model is of great essence to capture the economic value of the technology or idea (Margretta, 2002). The business model itself can also be used to create extra value to the idea or technology. In this scenario the business model is the innovation itself (Teece, 2005). This can be accomplished by the innovative use of the new models providing a lead in competition for the organization. Another option to capture extra value creation with an innovative business model, is the use of an additional business model. An additional business model is the introduction of the same idea into the market via two varied models. In this manner the firm will yield the possibility of two different economic outcomes to increase the chances of success (Chesbrough, 2010). Business model innovation has a positive impact to the commercialization but there are also a number of barriers the firm has to overcome to be able start with the process (Chesbrough, 2010). These barriers are discussed in the following section.

2.3.2 Barriers towards business model innovation

In the various resources, different barriers for organizations to business model innovation are mentioned. One of the barriers are the different key aspects of business model innovation. These aspects often vary from those of the traditional configuration of firms' assets. The differences often entail larger risks and experimentation, which acts as an obstruction for managers because of the threatened and unpredictable circumstances it can cause to an organization. Also the risk of the introduction of a new business model, which starts in most cases with lower gross margins, causes conflict with the established model. New business models need to be observed as more experimental models than proven business ideas (Mc Grath, 2010). As a result, the reactions of the companies towards signals provided by the new model can increase. Currently, it is unclear whether the signals of the business model already have to be used for the adoption. Also the information regulation and provision needs to be optimized in the corporate decision process to ensure the success of the new business model. The importance of the selected, extracted, and used information determines the manner in which the organization creates and captures its value from the business model (Mc Grath, 2010). A good fit of the business model will help organizations to react to changing environments in every stage of the development of the product.

Another barrier is the recognition of the best applicable business model for a particular business opportunity. Chesbrough (2010) states that it is unclear for managers which business model is ought to be the best option. This is explained as the cognitive barrier and is underpinned by another finding of Chesbrough and Rosenbloom (2002). These authors argue the success of the applied business model to be directly linked with the selection of information by corporate decision processes (Chesbrough, 2010). This decision process is influenced by the dominant logic of the company which results in search for information that is confirmed by this logic. The strategy is helpful in chaotic situations but forms on the other hand an obstruction towards implementation of potentially valuable opportunities (Chesbrough, 2010).

The process of business model innovation is also not costless. For example the development costs of a webshop or entering into new strategic partnerships (Zott and Amit, 2010). These expenses are not negligible but, compared to R&D, the costs are low. Business model innovation is not without risks and barriers, which explains the cautious attitude of organizations towards the implementation of the process. But the development of an improved market position, the extension of the potential customers and an increase in the value capturing, by creating an innovative business model, can improve the commercializing opportunities for products and services. In the next section the possibilities towards the process of business model innovation is discussed.

2.2.3 Possibilities for business model innovation

The innovation of business models increases the possibilities to the commercialization of renewable energies. In this section the way to recognize the possibilities for business model innovation will be discussed. The proposition of McGrath (2010) is to start with three critical conversations within the organization to identify potential business model improvements. The first option is to gain information by the leading technologists in the firm or with those employees who are designing the next generation concepts. This can be useful since they are working with all the future technologies without too much references to existing businesses. These employees are open-minded, which enables them to be the first to realize new business model constructions. The second option is having conversations with people who have knowledge about firms, but who are not direct competitors to the focal firm. They can provide the company with different insights in customer needs and restrictions. The last option that McGrath proposes is having conversations with “on earth non-customers today”. These people are customers that cannot be seen as potential customers at this moment, but who might become customers in the future. By direct interaction with them, possibilities can be found to serve them in the future. With these options a broad vision concerning the opportunities to potential developments of the business models can be sketched.

The abovementioned actions can be combined with the observation of environmental signals to indicate a window of opportunities for companies. A window of opportunity provides the possibility for organizations to adapt their model in a profitable way to stay ahead of competition. The recognition of an opportunity plays an important role towards the creation of the most beneficial business models. Without an opportunity there will be no meaning to further development. There is an ongoing debate concerning this topic. It discusses the origin of these opportunities to be discovered or created by the organization that deals with the opportunity. The debate will be further discussed in section 2.5.2.

The need of business model innovation can be observed by five strategic circumstances. These circumstance can indicate a window of opportunity (Johnson et al., 2008)). The first signal is the need for disruptive innovations because of the exclusion of potential customers by their financial limitations or the lack of skills. The second opportunity is to capitalize a new technology by wrapping a new business model around or by implementing a tested technology in a completely new market. Another possibility is the implementation of a job-to-be-done focus where this technology does not yet exist in the specific market. This means a shift in the value creation to a new unmet customer need, instead of competing on the same product properties as the other competitors. The fourth signal is when there is a need to fend off low-end disruptors. And the last signal that Johnson et al.(2008) mention, is the need to respond to a shift of competition not to be fend out off of the market by competition. By observing the entire market environment continuously, the necessary information can be provided and the possibilities and opportunities can be noticed. These five circumstances needs to be accurately observed and motivate companies towards the development of their business models.

When a window of opportunity is noticed, the customers value proposition should be specified. The specification of the value proposition is the key issue when designing a new business model (Teece, 2005; Johnson et al., 2008). Within this specification, the combination of the manner to deliver the value to the customer and to capture it, is of major importance (Teece, 2005). The same applies to the precision of the information provision concerning the real expectations and needs of the potential customer. This can be achieved by understanding the inner feeling of the potential customers with regard to the cost potential, performance and the other main value creators. The success rate of a good design increases when the firm has a deep understanding of the user's needs and understands how to deliver what to the potential customer (Teece, 2005). The organization needs to focus on one specific improvement in this manner, to prevent the often made mistake of doing lots of things without doing something well (Johnson et al., 2008). By taking into account the most common barriers, how people get that particular job done, a specific customers value proposition can be developed. These four barriers are known as insufficiency of health, access, skill, and time (Johnson et al., 2008). When the value proposition is clearly specified and translated towards all the stakeholders of the company, the firm is able to adapt their model earlier. There are various strategies to adapt and innovate the business model of an organization. In the next section the four distinctive directions to innovate a business model will be clarified.

2.2.4 Directions of business model innovation

After the identification of the window of opportunity and the customers value proposition, Amit and Zott (2001) observed four potential strategies or directions in which to innovate a business model. Within their article, they put their focus on e-businesses. Since their research is based on the theory of entrepreneurship and strategic management, this research is generally applicable. Amit and Zott (2001) notice the presence of four main value drivers when changing or adapting the value creation of a firm. The four value drivers are: novelty, efficiency, complementarities and lock-in. The drivers can be observed in Figure 5 and are also explained as the sources of value creation. As a recap (Osterwalder and Pigneur, 2012):

"A business model describes the rationale of how an organization creates, delivers, and captures value."

The goal of innovating the business model is to change the creation of value to the company with a positive outcome. Amit and Zott (2001) observe these four sources of value creation as the main pillars which can be adapted to innovate the business model of a company. By adapting one of these pillars, by changing the business model, the value of the firm can be increased and the market advantage will expand. The four strategies can be used by a company, in order to improve and adapt its business model and to stay ahead of competition. As shown in Figure 5, all the pillars are connected to each other, with the value creation in a central role. With the term novelty, the uniqueness and the newness of the business model is mentioned by Amit and Zott (2001). This can be changed by the innovation and adaption of other structures. The term lock-in can be explained as the manner in which the business model binds customers to the product or service. These constructions can force customers to consume a certain amount of the product and creates a secured amount of value to the company. Complementairy structures can guearantee a company income because the main product is sold to the customer. A famous example of this is the razorblade business model, where the razors are sold below cost price but the profit of the blades to be sold in the future will cover these losses over time. The last source is the efficiency. The transaction efficiency is mentioned and explains the phenomena when increasing transaction efficiency, a decrease in transaction cost will be made. The greater the efficiency, the lower the costs will be (Amit and Zott, 2001).

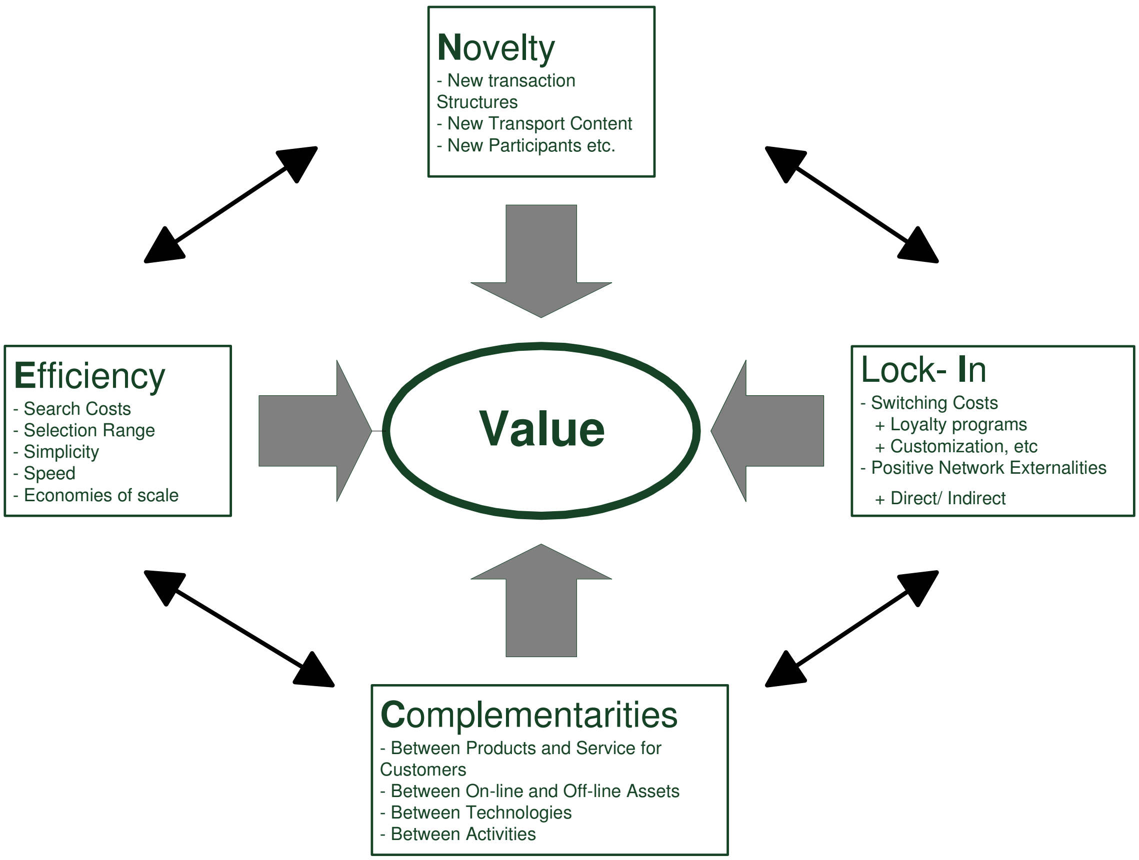


Figure 5 The Four Sources of Value Creation (Amit and Zott,2001)

Before a business model can actually be innovated, the current model of the organization needs to be clarified. One of the approaches to create an undertstanding of the business model, is the use of a mapping framework. The use of this business model mapping will be further discussed in the following sections.

2.3 Business model mapping

By using a mapping framework, the underlying process of the business model within an organization can be clarified (Chesbrough, 2010). The different mapping methods provide tools to virtualize the model within an organization and are used to assist and overcome the barriers of business model innovation (Chesbrough, 2010). The barriers to business model innovation can be overcome by business model learning. One tool to business model learning is mapping (Huijben and Verbong, 2012).

The main goal of this method is to structure the development of the formulation and construction of the business model. These development tools offer the solution for the smoothest process and help verifying the different parts of the business model. They also entail a diversity of benefits to future development, the implementation and the applicability of the models. For this research, mapping is an useful tool to create an overview of the various business models which are used in the Flemish market. By using business model mapping, a clear summary of the models can be created. In the following section the importance of such mapping methods will be further specified. In section 2.3.2 the use of the two applied models for this reseach will be explained.

2.3.1 Functionality of mapping

As explained before, mapping is an approach to clearly visualize an existing or new business model. This is needed because humans experience limitations of the ability to process complex information (Osterwalder et al., 2005). This can be improved by the visualization of these complex systems (Osterwalder et al., 2005). With the use of one of the mapping methods, the complex interactions and structures within a firm can be visualized and the understanding will be increased. Therefore the degree of complex situations that can be handled will increase and the transparency of the process, due to visualization, will also be positively influenced. Osterwalder et al. (2005) also state that well developed business models help to capture, visualize, understand, and share business logic. Mapping methods will help to implement all these major topics into the business model and provides the manner to be able to adapt most beneficial conditions for a good structured business model.

Business model maps also positively impact managers due to their developed guidelines, and as a translation tool for the strategic approach of stakeholders. A coherent typology as a mapping method provides a structured approach and helps classifying the business models, which makes them more easy to study (Wirtz et al.,2010). The structural way of the process guides them by offering a plan trough which managers create a shared understanding between individuals, groups and organizations who are involved in the process of developing the product or service. These kind of actions improve the understanding in the explanation of business models and how they act (Mason and Spring, 2011).

Business models need to develop over time to be able to adapt to environmental changes (Gunzel and Wilker, 2009; Andries et al., 2007). Andries et al. (2007) showed empirical evidence of the importance of business model adaptation due to the manifestation of the process also as a prerequisite for survival and growth, not only in emerging industries. Mapping frameworks help managers with the development of potential fundaments to structure business models to be able to adapt to the future environmental alterations. The models support the implementer of a business model to successfully cope with technology progress, competitive changes, and governmental and regulatory alterations (Wirtz et al., 2010). By using this approach, the model becomes more embedded in the market and a part of the organization. Implementation in this manner will help the organization to adapt to changing environmental circumstances and improve the interaction with the stakeholders of the organization. This process will help to construct a dynamic business model, which is needed since a business model is preferred not be static (Gunzel and Wilker, 2009). The maps provide a tool for the organization to be able to react to the changes now and in the future.

By using a mapping tool, more insight in the business model of an organization is created and potential possibilities come to light. In the next section the different tools to map a business model will be discussed. These two frameworks are also used in a later stage of this research, in order to map the different models in the Flemish market.

2.3.2 Mapping the Business Models

As discussed in the previous section, various tools are developed to map business models. The tools help organizations to visualize their business models to be able to create or improve their business model. The following two methods of Osterwalder and Pigneur (2010), and the Board of Innovation (2012), are consulted for this research project. These methods will help to structurally map the various business models in Flanders. These frameworks are shortly explained to gain an insight into their usability.

2.3.2.1 Osterwalder and Pigneur (2010)

The framework of Osterwalder and Pigneur (2010) explains the nine building blocks to use in the process of designing a business model (see figure 2 and 3). The framework allows a company to easily describe and manipulate business models to create new strategic alternatives. By using the nine building blocks, the four main influencing areas of a business can be specified: customers, offer, infrastructure, and financial viability. What the business model creates is similar to a blueprint. It provides a clear overview which will be very useful for the implementation through all organizational structures, processes, and systems. The book of Osterwalder and Pigneur (2010) explains the framework to learn the “language” to discuss, design, and describe business models, patterns, and explained techniques that facilitate the design and invention of innovative business models. The six business model design techniques (i.e. Customer Insights, Ideation, Visual Thinking, Prototyping, Storytelling, and Scenarios), are design tools to be used as complementary skills to design a model. Further in the development procedure the strategy focuses on a number of specific criteria (i.e. Business model environment, Evaluating Business models, Business model perspective on blue ocean strategy, and Managing multiple Business models). These criteria are explained to re-interpret the strategy used in the organization with the help of the map. In this way, the constructed business models and the environment in which they act, can stepwise be assessed.

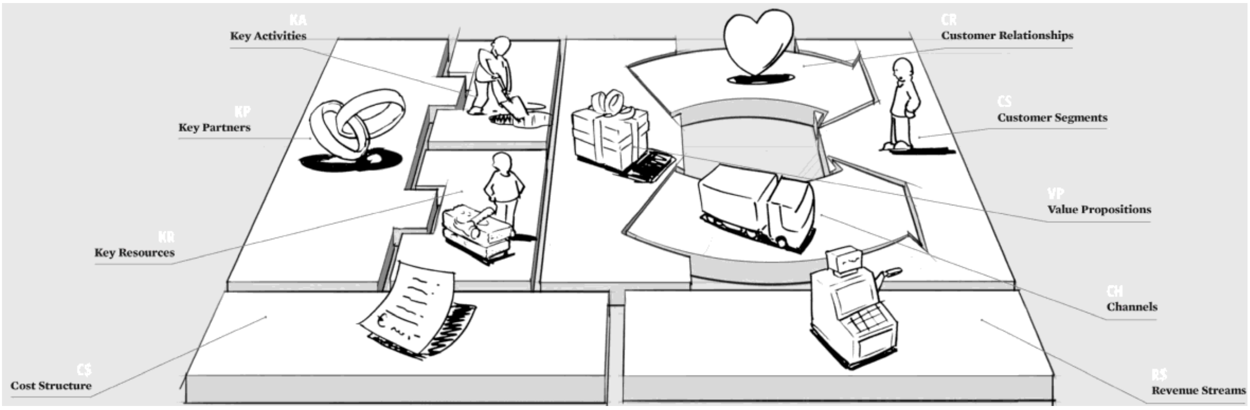


Figure 6 Business model Framework Osterwalder and Pigneur (Osterwalder and Pigneur, 2010)

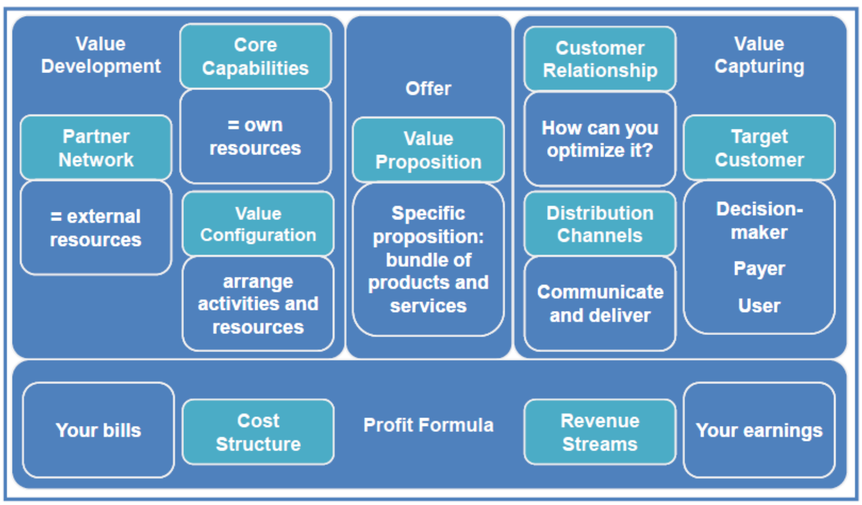


Figure 7 Business model Framework Osterwalder and Pigneur in words (Osterwalder and Pigneur, 2010)

With the help of the framework of Osterwalder and Pigneur (2010) the business model of the organization is clearly visualized. Within this framework, the model is created from the viewpoint of the organization itself. Besides the organization, the transactions, with all of its external constituents in factor and product markets, are of major influence to the final execution of the business model (Zott et al., 2010a). Zott et al. (2010a) redefine the business model as the structure, content, and governance of the transactions between the firm and its stakeholders (Zott et al., 2010a). These various stakeholders also participate in the value creation of the organization and are therefore indispensible for the business model. All the various stakeholders together are explained as the value network of an organization. A value network is the total picture of all stakeholders with an impact on the value creation of the product or service (Chesbrough and Rosenbloom, 2002). For a complete picture of the business model, it is needed that all the influences to the creation of value are visualized. In this visualization, the position of an organization is described and all connections with suppliers and customers, including the identification of potential complementors and competitors are shown (Chesbrough and Rosenbloom, 2002). One of the mapping tools for the visualization of the total value network is the Board of Innovation. The Board of Innovation clearly shows the connections between the different stakeholders within a value network. Therefore the tool of the Board of Innovation is used as an addition to the framework of Osterwalder and Pigneur (2010) to map the different business models applied in the Flemish market. The explanation of the application of the Board of Innovation will be discussed in the next section.

2.3.2.2 The Board of Innovation

The Board of Innovation is a consulting organization which is specialized in business model innovation and helps firms constructing improved business models. With the help a of self invented toolset, business models are analyzed and simplified to construct improved versions. This model may be considered to be the extended version of the previous Key partnership building block of Osterwalder and Pigneur (2010). The main purpose is to trace down a variety of opportunities and changes in the business model. By visualizing their constructions behind their revenue models, the business models are mapped, while using generic elements, to provide an easily understandable reflection. Arrows and financial streams are adapted in the model with the help of a business model brainstorm tool. In this process opportunities will pop-up and improvements can be made. The toolset includes 16 building blocks, constructed in a first and second part. The first part consists the six players, which are the main stakeholders. The second part consists the ten items to transfer who represents the items offered to the stakeholder were it is linked to. The 16 building blocks visualize the stakeholders and by puzzling new connections with different transfers can be found, resulting in for example improvements in the revenue model. The six players and the ten items are shown in Figure 8 and Figure 9 and are further explained in appendix 2.2.

Figure 8 The six players (Theboardofinnovation.com, 2012)

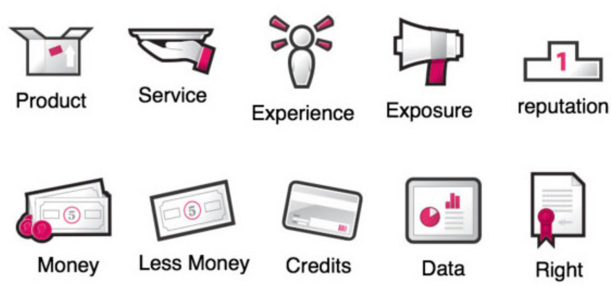


Figure 9 The Ten Items to Transfer (Theboardofinnovation.com, 2012)

After discussing business model innovation and mapping in general, the following section will specify the situation of renewable energy technologies. Both the internal and external influencing factors towards business model developments are broadly discussed. The last section of this chapter will discuss and sum the various PV business models found in the literature.

2.4 Influencing factors PV business models

To realize the commercialization of the PhotoVoltaic systems the barriers to enter the market needs to be overcome. According to Wüsterhagen and Boehnke (2006), new business models and the improvement of value creation can help overcome the barriers to the commercialization of renewable energy technologies. By innovating the elements of business models, new business models can be constructed to improve the feasibility of the commercialization of renewable energy. In the following section the influential factors to business model innovation will be explained for renewable energy in general, thereafter a specification is made towards the PV situation. The main barrier to the commercialization of renewable energy is the financial aspect. This aspect and two other Features will be discussed in the following section.

2.4.1 Financing the implementation of PV

The financial situation in the renewable energy sector is still one of the main friction points concerning the commercialization. Commercialization can be defined as the creation of a self-sustaining market that thrives a level of playing field with other competing technologies (Balachandra et al., 2010). The public benefit of sustainable energy was the first driver to promote and develop new techniques to generate renewable energy. The downside is that most potential customers do not experience this proposition as a motivation to purchase the product. This complicates the commercialization of renewable energies. The renewable technologies, compared to the conventional, are still expensive and have low efficiencies, which makes the payback time relatively high. To be competitive in the market, consumer prices need to be comparable to those of conventional technologies**.** This can be realized by adaptations in the cost structures of the business model. Different financial strategic constructions can be developed to overcome the financial barriers. Examples of solutions to make a technology feasible are to support constructions of third parties and mergers. The possibilities will be discussed in this section. Within this research, the investment in the production side of sustainable energy is meant and not the investment in the R&D, since this is not part of the research.

The opportunities to invest in sustainable energy are enormous because of the capital intensiveness of the market (Wüstenhagen and Teppo, 2006). Despite these opportunities, the renewable energy sector still faces some major problems in the search for funders. Sustainable energy technologies create both societal as private benefits. The technologies have to compete with conventional energy resources in terms of private value. Venture capital is the main financial source to apply for an investment. Only the private benefits of the technology will help to collect this private financial support. Observing this private value of the renewable technologies nowadays mostly shows an equation disadvantageous for the renewable technology. Because the renewable energy technologies are still in the beginning of the learning curve which entails high development costs (Wüstenhagen and Teppo, 2006).

Only two till five percent of all the venture capital is invested in the energy sector on yearly basis (Wüstenhagen and Teppo, 2006). The reason for the reticence of the venture capitalist is subdivided in three main arguments constructed by Wüstenhagen and Teppo (2006). The first argument is the low perceived returns which are provided by the returns of the venture corporate investments, compared to other projects. Another reason is the high perceived risk involved with the investments (i.e. market adaption risk, technology risk, exit risk, and regulatory risk). Lastly, the evolutionary perspective, the maturity of the specific sustainable energy technology is unpredictable but hopefully infinite (Wüstenhagen and Teppo, 2006). Because of the long duration and payback time of the projects the venture capitalist will have to stay involved. However, the involvement strategy of most investors is to get their funding back within seven years. To increase the possibility of raising funds these arguments need to be taken into account and the opposite needs to be proven to the potential investors. The potential investor needs to be convinced of the beneficial potential provided by the investments in the renewable energy sector. Besides the investments by large organizations other options are used to finance the projects. One of the options is called "close-end funding" (Enzensberger et al., 2003). Close-end funding is a manner to finance projects with private investments. In the PV sector the financial situation is also mentioned as one of the barriers to commercialization. The next paragraph will discuss the specific conditions.

Solar Photovoltaic Systems

Most commercialization strategies that are used to increase the diffusion of technologies in the marker tend to emphasize cost-benefit ratios and application matching. The development of renewable energies requires enormous capital impulses and long lead times (Chang et al., 2011; Wüstenhagen and Teppo, 2006). One of the main barriers to the large scale application of PV systems are the costs compared to those of the conventional technologies (Huijben and Verbong, 2012). The capital intensity of the technologies is one of the key concerns and makes the reduction of the upfront costs in the renewable energy sector very important (Boehnke and Wüsterhagen, 2006). PV systems are unfortunately still influenced by the relatively high prices, unattractive product designs, user conditions, and the skepticism of customers who must understand the ecological claims made by the organizations (Walsh,2012). With the help of a careful focus on the customer problems solved by the product, the personal benefits of customers can be set up front instead of the public benefit. With the help of this shift in the value proposition of the sector, the potential set of customers can be expanded beyond the eco-niche that it used to serve (Wüsterhagen and Boehnke, 2006).

Different solutions to overcome the barrier of the initial investment are constructed. Most PV systems are micro-generated, which means the generation of energy on small scale. The major issue for the commercialization of these micro-generated systems is the significant initial investments for owners. New developments in this area are special loan constructions to finance these specific green investments (Jagoda et al., 2011). Another option of investment is applied in California and is the adaption of PV stimulated by the use of third parties ownership. In this investment construction the commercial companies own and operate PV systems. The companies lease the equipment or sell the electricity generated to the inhabitant of the building where the PV system is placed, as also discussed in the previous section (Drury et al., 2012). The importance of these third parties, which invest in the technology, is primarily the financial input. The commitment of the organization in all aspects of the development process is another success factor to the innovation of the renewable energy technologies (Walsh, 2012). These kinds of investments in the PV sector are mostly oriented to the development of renewable energy technology. By using this kind of financial constructions, the bridge towards adaption of the product becomes smaller and the feasibility of the diffusion of the systems in the market increases.

2.4.2 Implementation strategy

To meet the factors to expand the potential PV market, several conditions for PV are valuable to be considered by the organization. The business model and marketing strategy need to match for a smooth diffusion of the technology in the market. To match the business model and the marketing strategy to the potential market in which the product will act, the specific market needs to be defined and described. Balachandra et al. (2010) state that particularly in the renewable energy sector understanding of the market is needed. These markets have relatively minimal attention compared to other technologies, therefore the potential market is more difficult to identify (Balachandra et al., 2010).

The commercialization environment of the renewable energy technologies is defined by market dynamics as technology-push and demand-pull drivers (Walsh, 2012). Both drivers are indentified as motivators for the diffusion of innovative technologies in the market. Their goal is to contribute to the market adaption by transforming the push and pull environments into an innovation (Walsh, 2012). Walsh (2012) states that each of the environments is characterized by certain types of innovation, levels of commercial risk and dependency of third parties. The phenomena's of technology-push and demand-pull are a manner to describe the situation in the market. In the situation of a technology-push, there is the need for the customer to adapt to the innovation. In the case of a recognizable knowledge and sophistication of the value proposition of the innovation and a certain demand for the innovation, a market potential for the renewable product can be observed (Walsh, 2012). The sophistication or knowledge level of the potential users about the technology has serious impact on the diffusion of the product. Therefore, these levels need to be understood before developing the implementation strategy.

Marketing strategies differ per level. A strategy towards a target group with a low level of commitment needs to be very aggressive and convincing, to persuade the market about the strength of the product. In this scenario, the energy companies should provide wide publicity for the use of renewables and show off the successful experiences in the private sector. This can be performed by disseminating market analysis, potentials, and prospects of the new renewable resources (Charters, 2011). In the case of a demand-pull, there is a demand for the specific product form the market and the strategy varies. The demand depends on two factors: the easiness of use and the cost of the product. Both factors are influenced by the manner of exposure. By increasing the exposure, the awareness, accessibility and availability of the product, a positive impact on the purchase decisions of customers is realized (Walsh, 2012). Some specific conditions can be used for the marketing strategy in the solar industry.

Solar Photovoltaic Systems

In the particular case of solar PV systems, some specific conditions are stated. The factors are distracted from observations in countries with more experience with the diffusion of the solar systems. The lack of rational marketing planning and sufficient marketing activities is one of the barriers for solar thermal systems to be overcome (Tsoutsos, 2002). A properly developed marketing strategy needs to be developed and adapted to the various types of international markets in which the systems are acting (Tsoutsos, 2002). For the realization of a uniform marketing strategy in the solar thermal market, a marketing group was composed initiated by Mediterra Solar. To be able to make the transformation, from acting in a niche market towards the diffusion in the energy market, the group observed five activities to support the sustainable presentation. According to the European Commission the following five activities are observed: the motivation of the population to adapt PV, the technical development of the product, creative solutions towards distribution and sales, information provision for craftsmen and consumers and additional activities to stimulate the implementation (Tsoutsos, 2002). These factors influence the marketing strategy and are of importance for a total understanding and successful promotion of the marketing of PV systems (Peter et al., 2002). By using these specific factors the marketing strategy can be adapted to the specific constraints of the PV market and diffusion will be stimulated. The third barrier to the diffusion of renewable energy in the market is the change to decentralized production. In the next paragraph, adoptions to the grid for this change will be discussed.

2.4.3 Adoptions to current conditions

For the implementation of PV systems, one of the main questions is the choice between targeting the conventional energy market or focusing on the niche markets (Walsh, 2012). For the commercialization of PV there are two markets: the grid-connected solar systems and the electrification in rural areas with a lack of connection to the grid (Pinkse and Van den Buuse, 2012). These two potential markets represent the options for the commercialization of PV. The niche markets needs to be expanded and the switch towards the diffusion in the conventional market needs to be made. To be able to expand the potential market, adoptions needs to be made in the provision of energy (Shum and Watanabe, 2010). Asmus (2008) states that the era of highly centralized systems is coming to an end and it is time to adapt to these changes. For the utilities in the market, the developments concerning the decentralized electricity production can cause some major changes for their future business models.

The utilities in the mainstream market look carefully at the developments and their possible opportunities in the market. For the big companies, the developments of large scale commercialization of solar PV seems to be the most interesting option. In this manner they can continue with the same business models they use nowadays, by generating and providing electricity to customers for a certain price per kWh. The generation and transportation of the electricity produced by PV systems is totally different compared to the conventional energy generation, which means that this entails an adapted approach. The research performed in this sector shows the counterproductively of the commercialization when using a large-scale and large-investment promotion. An increased in innovation success id observed trough the sum of smaller successes in the energy sector (Walsh, 2012). This field covers a number of researches focusing on the possibilities for big utilities to develop business model innovations to be able to conquer the PV market. The opportunities of commercialization are increased when innovating the conventional business models into profitable models applicable to the energy generation on smaller scale.

Other influences of the further diffusion of PV in the market are the changed conditions for the grid. Shum and Watanabe (2010) state however that an adoption to the grid will cover the future developments in the PV sector. For an efficient use of the energy generated by the solar PV, the power grid needs to be adopted to improve the information sharing about the available energy for an increased efficiency. This is called the Smart Grid; it equips generators with intelligent sensors and communication devices to provide information exchange between energy storage devices, and buying and selling constructions of the generated renewable energy (Shum and Watanabe, 2010). When the diffusion of the PV systems is in a more adult phase, externality effects will improve the quality and functionality of the smart grid. As a result of the increase in trading partners and the urgency of improvement of the grid.

Brown and Hendry (2009) state that, due to the implementation of the new technology into an existing system, there an urgent need is for newly designed energy exchange systems. A solution would be a self-sufficient power system in combination with a grid, which can intervene with an interface unit to manage the energy exchange. The combination of energy provision and storage could be a manner to adapt to the changing conditions (Brown and Hendry, 2009). Within the article of Asmus (2008) the option of the use of a battery is also discussed, but with the target to be able to provide energy in every scenario, where the normal grid would lack.

These different opportunities have their own impact on the development of PV business models. The adaptation in the supply of the energy results in a transformation of the value creation, because of the changed customers benefits with regard to the supply. Due to this change, adaptations need to be made within the business model to receive the optimized outcome for the improved situation of the company. By adapting the business model to the opportunities, the feasibility of the earlier mentioned shift from niche markets to the conventional energy markets will increase? increases.

In the previous section, the several barriers that influence the commercialization and the developments of business models for renewable energies were discussed. The second factor that influences the development(S?) of business models, are the external factors and the adoption speed of the organization towards changes in this area. The Board of Innovation (2012) uses the governmental influences as one of the six players. Unfortunately, the topic was not exclusively discussed in most other methods. Therefore, the external factors will be discussed in the following section.

2.5 External factors influencing business models

The development of a business model is an important source to competitive advantage for new ventures in the PV sector. The available literature about business models focuses on strategic management of internal resources as constraint in the development process. In the energy sector, the external factors are as influential in shaping these business models and need to be taken into account (Provance et al., 2011). External factors are difficult to influence by a single organization and are mostly caused by governmental decision making. This is confirmed by the second factor of Schleicher-Tappeser (2012); the adaption speed of the regulatory framework. The regulations and energy policies affect the development and implementation opportunities of the technology notable. They provide the main stimulators by the provision of subsidy and other beneficial regulations.

Consumption in general is influenced by a number of personal choices, which in their turn are influenced by environmental constraints. These constraints are the external factors (i.e. the available infrastructure, the nature of the energy system, the ability of connection to the grid and other predetermined conditions) (Hertwich, 2006). The constraints need to be considered when constructing a business model, because the adaption speed towards changes in the regulatory system is one of the main influential factors of the diffusion of technologies in the market (Schleicher-Tappeser, 2012). The policies of interest need to be considered during the development and implementation of the business models to be able to construct the most beneficial model.

Ayoub and Yuji (2011) divide the various policies in four main renewable energy promotions strategies: Feed-in Tariff; Quota obligations; subsidies and taxation and unstructured initiatives. The Feed-in Tariff is explained as governmental determined renewable electricity prices so that the network operators will purchase the electricity with a suitable profit margin to ensure the market competency. The second promotion strategy is the quota obligations; a certain amount of renewable energy should be produced by energy producers and this is regulated by the government. The third strategy is the promotion with the help of subsidies and taxation. In this strategy subsidies are provided to reach a certain goal of the country and taxation is favorable to renewable energy development and aims at the decrease of conventional energy production. The last strategy found is the unstructured initiatives this is explained as supporting programs not related to the general plan of the country (Ayoub and Yuji, 2011).

To include the impact of all the governmental influences and other external factors Provance et al. (2011) developed a framework based on the work of Morris et al. (2006) (see Figure 10). The model distinguishes from the other frameworks, since most existing literature primarily focuses on the strategic management of the internal values, strategies, and resources of the organization. The framework takes the external factors, political and socio-cognitive institutional factors also into account (Provance et al., 2011). With the help of this adapted framework, the development of a business model is more focused on the external variables and is less oriented on the decision-making part of the firm (Provance et al., 2011). The impact of the framework on the design of a new business model varies among the circumstances in which the model is developed. Provance et al. (2011) state that the impact will be bigger in industry sectors where institutional forces are stronger. This will result in a business model where the basis is shaped by the impact of the political and social dynamics, as shown in Figure 10.

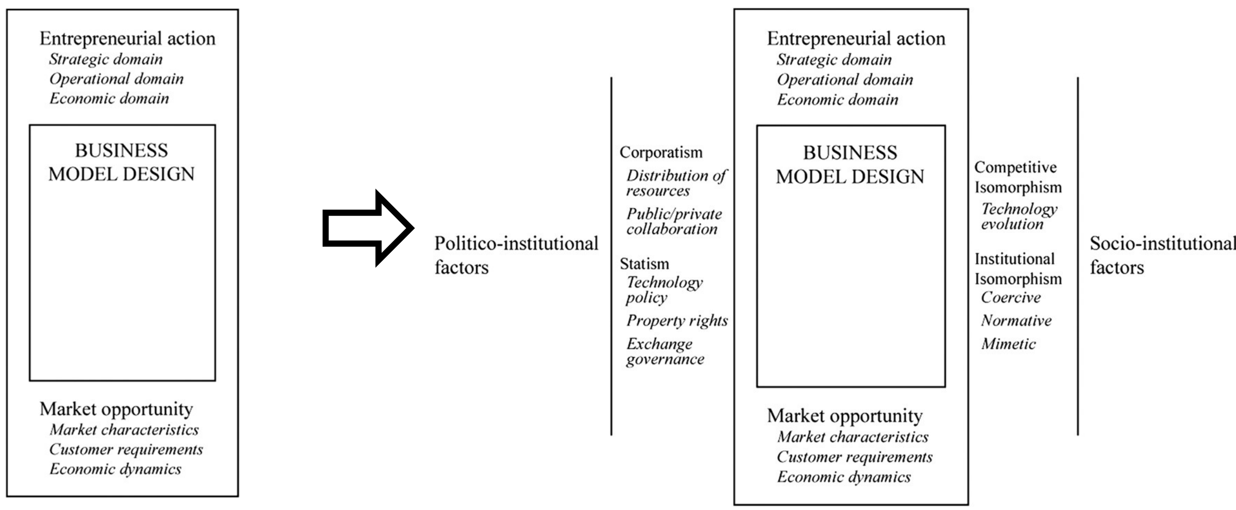


Figure 10 Business Model Framework With External Factors Implemented (Provance et al., 2011)

This model shows the importance of external factors to business model development. Therefore the external influences will have a specific role during this research. The following paragraph will discuss the impact of these external factors in the renewable energy sector, in particular for PV. To sketch an overview of the possible business models applicable in the PV sector a summation is made in the next chapter. This overview provides an insight in the different models that can be used to improve the diffusion of PV systems and whereto the influencing factors can lead.

2.5.1 Legislation and Subsidy

In the previous section, the second factor that influences the potential developments of the regulatory system were introduced and the importance of these developments have been discussed (Schleicher-Tappeser, 2012). The recent increase of awareness for renewable energy technologies, with in respect to climate change, has contributed to the last developments in renewable energy investment. An other important role is also attributed to the improvements on regulatory conditions (Bürer and Wüstenhagen, 2009). Renewable energy technologies create of societal value by the avoidance of emissions and reduction of the dependence of the import of energy resources. Therefore, it is attriactive for governments to invest in PV (Wüstenhagen and Teppo, 2006). The provisions of subsidy for a certain technology and, at the same time, the regulations and energy policies, affect the development and implementation opportunities of the technology notable. The regulation interventions can be seen as a source of opportunities as observed by Eckhardt and Shane (2003). Organizations can react to these new opportunities by innovating business models to expand their potential markets. The impact of the different policies and subsidies on the widespread diffusion of renewable energy in the market will be discussed in the following section. In the last section of this paragraph the origin of the opportunities will be further discussed.

2.5.2 Policies

Currently, the legislative conditions in different countries for renewable energy technology form an obstacle for renewable energy technology. The governmental impact in the PV sector is still influencing the possibilities to the commercialization. Charters (2001) explains in his article the importance of governmental agencies to remove the legislative and institutional barriers. Those obstacles are hindering the widespread diffusion of the technology. Government agencies need to support the removal of those legislative and institutional barriers hindering the implementation of renewable energy sources.

The variation in legislation between countries is an other impediment. This variation causes problems with respect to development and adaptation, mainly because the applicability of different rules unnecessarily complicates the global implementation (Provance, 2011). By equalizing the laws, the development and implementation process can be accelerated and time can be won in the process of commercialization.

By a smarter use of demand and supply-side of government policy tools, sustainable innovation can be stimulated (Charter, 2006). Governmental policies can be used for the implementation of stricter penalties for a low level of sustainable development within an organization. More important is that, for the provision of positive incentives for improvements in sustainable development, governmental policies encourage the creation of more opportunities for sustainable innovation and development. Charter (2006) provides the example of the producer responsibility laws, introduced in Europe and Japan. The law provides a platform for the development of various new sustainable business concepts. This is observed in the business-to-business markets where the “take-back services” and “pay-per-use” models are a result of the policies. These opportunities also emerged on the demand-side (Charter, 2006). An example in the scenery of sustainable energy is a decrease in cost per kWh when the consumption decreases, in order to stimulate energy efficiency of the consumers. Other possibilities are observed in the literature, where fines or tax increases are applied to customers of conventional energy suppliers.

Obviously, changes in legislation are causing shifts in the balance of the market. Eckhardt and Shane (2003) explain this as the source of new opportunities**.** They argue that the exogenous shifts in information are the cause of opportunities; the opportunities can be used as stimulation for the commercialization. Attempts to influence the legislation can also positively affect the commercialization. With the help of creative solutions, the success factor can be increased and positive outcome can be realized. Due to possible changes, renewed business models can be constructed and diffusion improved. There are various examples within the PV sector, where organizations are bundling the strengths of the market to collectively influence governmental regulations. These examples are shown in the following section.

Solar Photovoltaic Systems

In the field of solar energy ventures, a second party, the Solar (US) Energy Industries Association (SEIA), is often used as point of mutual interest to spread the needs of the industry. This organization has pleaded powerfully for interests of the industry by active lobby of legislators and other authorities. The same organization is active on the European market, the EPIA. And even parties active on smaller, national level, like Holland Solar. Other partnerships can contribute to the effectuation of energy legislation, as what is observed on local level, where new ventures often benefit by partnering with nonprofit organizations (Pacheco et al., 2010). This effectuation seems to be an example of the creation of an opportunity by the parties that try to influence the government. This effectuation will be further discussed in section 2.5.4.

2.5.3 Subsidies

An important part of the governmental policies concern the provision of subsidy in a country. Stimulation of the development of PV can be performed with the aid of subsidies. Various types of subsidy are provided for a specific sustainable energy. When developing a product, different kinds of subsidies can be addressed, starting from start-ups funding to specialized funding in specific research areas. With the development of sustainable energy, extra possibilities can pop-up because of additional governmental stimulations. An enormous selection of rules are attached to the selection process which are particularly used to screen firms for their actual sustainable consumption. The sustainable consumption considers the ecological and social criteria during the purchase, use and post purchase (Beltz, 2006). Not all steps in this process are applicable for a sustainable energy technology. For subsidy in this sector, two remaining points of interest need to be taken into account when applying for a subsidy. The first factor is the use of sustainable resources for the development of the technology (i.e. are the materials used environment friendly). Within the reflection, the entire process to the source of purchased products is considered. The second factor is the waste management of the residual and the end product. Where the possible degradability of this part of the chain is assessed. The rules and conditions for a subsidy fluctuate per country and specific technology, but in general these two factors are the main points to be considered.

Subsidy mechanisms nowadays are mostly focused on the development of the renewable techniques, i.e. its one-time demonstration, rather than its diffusion in the market. Balachandra et al. (2010) state that this way of subsidizing is acting more as market distortion rather than attraction. A preferred option would be the use of incentive schemes to ensure the first time purchase of the technology, its continuous use, and availability of replacement after the elapsed life time (Balachandra et al., 2010). Government stimulation programs will also be improved when, during the pre-commercialization and support commercialization phase of the life cycle, supply-push and demand-pull policies are included (Balachandra et al., 2010). In the matter of incentive schemes, the prices of the energy and technology can be joined together since the entire energy service is packaged. Balachandra et al. (2010) propose five changes in manner of subsidizing with respect to the incentives:

reimbursement of the expenses made on the purchase of the technology, providing loans for the purchase, the release of "Green- Credits" based on the quantity saved energy, tax incentives for the purchase, and energy price discounts for the adopters of the sustainable energy technologies. Balachandra et al. (2010) plead for the unlimited implementation of these projects being universal to all the adopters of the technologies to promote the diverse commercialization of the technology. In some countries this kinds of systems are already in use and seem to pay off. In Germany the feed-in tariff system is used for the stimulation of wind and solar energy. This is a policy mechanism designed to stimulate investments in renewable energy technologies. Due to the use of the feed-in tariff system costs per kWh can be equalized for the customer, compared to the conventional technologies. This is achieved by governmental compensation for the extra costs of the technology. Over time the compensation will decrease since the costs of the technology will decline because of economies of scale and increased efficiency. Lots of other stimulating constructions exist over the world but the best option is still not been proven.

The wind energy market is a mature market with a well-developed energy technology. The market conditions of the wind market can provide interesting lessons issues for the energy technology market (bedoel je dit?). The observation of these developments and the extraction of useful knowledge can be translated to the situation of PV systems and other renewable energy technologies. After the observation of wind energy, Burer and Wüstenhagen (2009) conclude that the feed-in systems can bear the responsibility of the largest addition in renewable capacity and generation. Where the development of the use of green certificates currently even presents higher support levels, both systems seem to have their positive impact on the development and diffusion of the technology in the market (Burer and Wüstenhagen, 2009). Burer and Wüstenhagen (2009) also conducted a questionnaire researching where governments should focus their stimulations. They observed a preference for market-pull policies rather than technology-push policies when it comes to the promotion of the investment in clean technology. On the long-term, these findings were more or less contradicted by a number of interviewed experts who believed in the importance of a policy mix of both technology-push and market-pull instruments. These include market engagement programs, strategic deployment policies and the removal of the barriers. This policy mix is preferred to stimulate investments over the entire life span of the innovation chain and continuous encouragement of innovation for a variety of new sustainable energy technologies (Burer and Wüstenhagen, 2009). Arutat (2010) researched the policy comparison of support models in different European countries and observed a clear effectiveness of price regulation compared to regulate competition. These observations show the importance of country selection for the implementation of the renewable energy technology. The corresponding strategy towards the regulation and stimulation of the various countries have a significant impact on these circumstances to the commercialization of the sustainable energy technologies. Tthe subsidy mechanisms also vary per country for PV systems. The following section will explain the specific impact for this technology.

Solar Photovoltaic Systems

Within the PV sector, different kinds of technologies are developed nowadays. This diversity spurs technological development and diffusion of these solar technologies. Stimulation of the development can be performed with the aid of subsidies. As explained above, this stimulation is not in every case the best policy to final development. Specific policy instruments are required to achieve development and market creation in the PV sector. In the article of Sandén (2005) and Shum and Watanabe (2010), the German feed-in tariff is promoted and indicated as a successful strategy useful for the stimulation of solar PV. With the help of this system dynamic cost efficiencies can be reached due to the increases in adopted systems. The implementation growth leads to a decrease in costs due to economies of scale (Sandén, 2005). Sandén (2005) also mentioned the impact of positive feedbacks when a product is more often used. This also indicates the first mover advantage in the sector and results in an increased confident to invest in the PV systems. Finally, Sandén (2005) implies that, once a firm is established in the market, the technology will increase his strength in the market even more because of the adapted market structure towards the technology. The implementation of specific PV solar subsidies will also influence other developments in the energy sector. The competing technologies could be negatively influenced since they will become less attractive proportional wise. Sandén (2005) proposes the subsidies to be composed by taking the following two conditions into account. Firstly, the subsidies have to work as a promotion to a process of self-sustained growth, which is caused by the dynamic learning and economies of scale. This leads to a reduction in costs and causes market growth, to lead to another decrease in costs, etcetera. Secondly, the subsidies have to promote the development of a market able to survive in the future without the necessity of financial help. Therefore the subsidies need to decrease over time in proportion of the future needs of the developed market (Sandén, 2005). An optimal diffusion of the PV and the creation of a sustainable market can be stimulated with the help of these two conditions.

When taking the two conditions into account, the commercialization of PV systems becomes better feasible and the diffusion in the energy market is stimulated. During the construction of business models the external situation needs to be sketched and applied in the process. Using the external factors can lead to a maximal result. As been discussed in the last two paragraphs, the business models and external factors have an influence on the commercialization of PV systems. In the following paragraph, the importance of a government, with regard to their impact to the rise of new opportunites in the market, will be discussed.

2.5.4 Opportunities

Changes in the legislation concerning the PV systems cause the need for companies to adapt their business models. On the other hand are the legislative changes sometimes introduced and pushed by organizations in the sector to be able to develop their business model. These two different kinds of adaptations to the law have a common outcome, the appearance of opportunities. Because of the changes in the legislation the development possibilities of the models shifts and opportunities pup-up. The PV sector is an upcoming market that is mostly dominated by entrepreneurial initiatives. Most entrepreneurs are motivated to begin a start-up because they experience the opportunity for a profitable business case. A debate is ongoing concerning the opportunities the entrepreneurs experience and the origin of these opportunities. Within the previous paragraphs the main idea was already introduced in some sections, the following section provides the summary.

With the help of creative solutions concerning influencing legislation, the success factor of a project can be increased and positive outcome can be realized. Changes in legislation obviously cause shifts in the balance of the market, what is explained by Eckhardt and Shane (2003) as the source of new opportunities, caused due to the changes in information of the resources and technologies used. They discuss this type of exogenous shifts in information as a cause for opportunities. The opportunities can be used as a stimulation for the commercialization of the technologies. Due to possible changes renewed business models can be constructed and diffusion improved. For PV oriented ventures a second party, the European Photovoltaic Industry Association (EPIA) , is often used as point of mutual interest to spread the needs of the industry. This organization has plead powerfully for interests of the industry by active lobby of legislators and other authorities. Smaller parties are also active on national or regional level to beneficial influence the regulatory systems. Other partnerships can also contribute to the effectuation of energy legislation, as on local level new ventures often try to benefit by partnering with nonprofit organizations (Pacheco et al., 2010). This effectuation seems to be an example of the creation of an opportunity by the parties that try to influence the government.

Regulation intervention can be seen as a source opportunity as observed by Eckhardt and Shane(2003). They researched the influence of governmental actions in the electric power industry and observed a shift in entrepreneurial opportunities because: the regulations mutated the market structure; created markets because of the implementation of purchasing guidelines; and regulated the returns on capital (Eckhardt and Shane, 2003). They further elaborate this phenomena and the debate concerning the origin of opportunities is discussed. One side of this debate states that the party in the environment subjectively perceives and even creates the opportunity where is responded to (Renko et al., 2012). The other side of the discussion explains an opportunity to be an objective phenomena that exists in the environment, and this opportunity is discovered by an alert entrepreneur (Renko et al., 2012). This is an interesting debate in the case when discussing the influence of legislation towards the development of business models. There can be questioned that the legislation is adapted to the developments in the market, the legislation is pushed in a direction because of existing players in the market. Another option is the development of business models because of changed legislation. The influence of utilities is also mentioned in the literature, where these parties try to prevent beneficial legislative changes for the diffusion of PV in the market. The utilities in the energy market prefer the provision of energy as it is nowadays and try to delay the shift towards a sustainable energy. This research will be mostly focused on this issue where the governmental changes and business model developments are mapped over time. The goal of mapping these developments is to recognize patterns in both developments to link them and be able to draw a conclusion using these linkages.

Within the previous part of this chapter the influences of business models and governmental policies on the diffusion of PV was broadly discussed. The next step is to observe the actual business models discussed in the literature. The following section will explain the business models which are actually observable in the global PV market.

2.6 Business models for the PV sector

The decisive role of a business models in a company is already elaborated in the previous chapters. Numerous factors have their impact on the development and design of these business models and were discussed in the previous sections. This paragraph will provide an overview of the possible business models in the PV sector, which were found in the literature.

Most commercial PV systems implemented nowadays are micro-generators. In the article of Provence et al. (2011) business models in this microgeneration sector are discussed. Because of the overlap with the PV systems the findings of this study are also applicable to the PV market and provide an interesting insight. Provence et al. (2011) provide a set of decisions that need to be made to choose a business model in the sector. The first consideration concerns the generation and transmission of the electricity. Does the organization prefer the provision of the electricity on residential, commercial, or community scale. Also the design of the networks, ownership and supply chain components need to be determined, to assure the compliance with regulatory organizations (Provence et al., 2011). The choices are summarized in the following three types of business models; Plug-and-Play, Community Microgrid and Company driven, developed by Sauter and Watson (2007). The three models are an addition to the distinction of Schoettle and Lehman-Ortega(2010), and are shortly explained and summarized below (Provence et al., 2011).

The first business model they observed is the Plug-and-Play model. This model refers to the traditional business models in which the product is developed and marketed. In this model the PV system is sold as a package that is purchased and installed via retail channels (Provence et al., 2011). For this business model the competition is high since no extra service is offered and the products provided are very similar.

Community microgrids can be explained as constructed agreements formed in municipalities or regions to collectively purchase and install the PV systems to share the responsibility and energy which is generated. In this construction the end users are forced to stick to the consequences of the responsibility but they also benefit from the minimization of the costs of the energy production and transportation.

Company driven models are business models mostly based on the provided service. The producing company installs the PV system at the customer but retains the ownership over the system. The company provides the service of installation and provides the sustainable energy to the customer at a certain price per kWh.

The three business models can also be combined in specific situations to provide a more profitable outcome. The three business models are all applied in the market and some trends towards their potential use is observed. In the rapport of Frantzis et al.(2008) an overview of the development of business models is provided with the use of a three generation timeline (see Figure 11). In this overview the first model of Sauter and Watson (2007) can be placed in the Zero generation PV business models, where the customer finances, owns and manages all the aspects of the installation of a system. The customer in this business model is the innovator or the pioneer who is attracted to the product because of its product specific benefits. This is a limited potential group and can be explained as a niche market. The community microgrids and company driven models can be classified in the first generation business models. The generation of models is more attractive to a broader potential market, since the financial conditions are improved. The customers in this part of the model are the early adaptors. Frantzis et al.(2008) proposes a second generation business models which has not emerged yet. The second generation models have improved integration facilities for the PV systems to the grid. Frantzis et al.(2008) state that this development will manifest because of emerging technologies and the development in regulatory initiatives who will make the integration into the grid more viable and valuable (Frantzis et al., 2008). In Figure 11, an overview is shown of the evolution of the PV business models with an implemented prediction for the development towards the next generation.

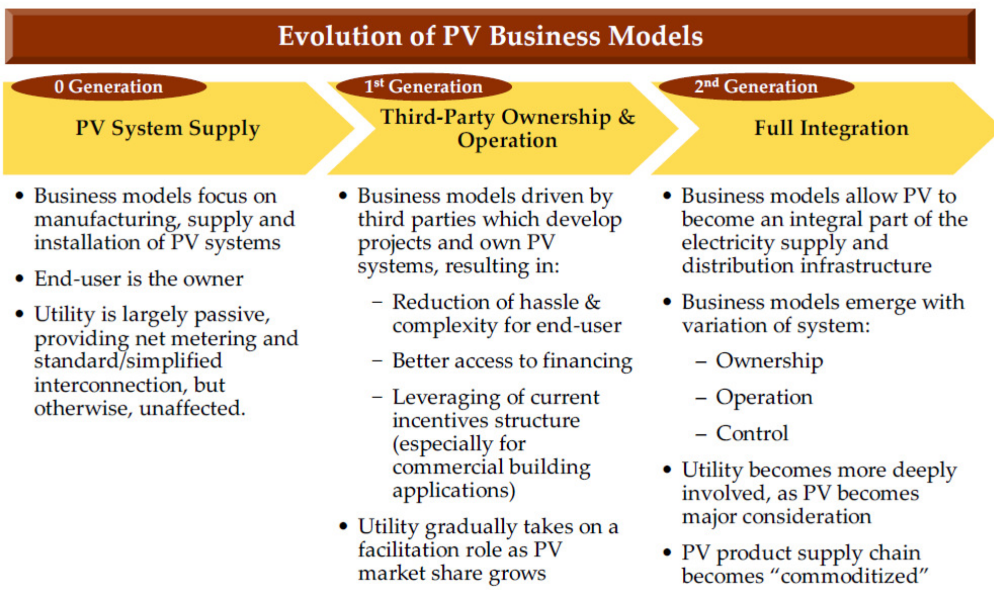


Figure 11 The Evolution of Business Models (Frantzis et al., 2008)

Nowadays in the industry changes take place concerning the regulatory frameworks and business structures. By improving the efficiency of business models the developments in the PV sector are slowly moving towards the achievement of higher level of maturity and scale. According to Frantzis et al. (2008) these changes in the zero and first generation models will help moving the industry down the cost curve and up the market penetration curve.

To detect the major components of business models in the PV market Schoettle and Lehmen-Ortega (2010) use the another strategy. They use the definition of Osterwalder and Pigneur (2010) to observe two main components of the business model, namely the value proposition and the value constellation of an organization. The value proposition is the value created for a specific group of customers offered by a technology they value (Chesbrough, 2009; Schoettle and Lehmen-Ortega, 2010).

The value constellation refers to the manner how this value is delivered to the customer, including the value chain of the firm and his value network with supplier and partners (Schoettle and Lehmen-Ortega, 2010). This is influenced by the configuration components who describe how an organization creates the value where it derives its revenues from (Boehnke and Wüstenhagen, 2007). These two components need a to perfect fit to positively influence the final desired outcome of a business model, the profit equation, as discussed by Zott and Amit (2008)(see Figure 12). The profit equation can be seen as the translation of the outcome of both components, the sales generated thanks to the value proposition and the financial structure resulting from the value constellation. Schoettle and Lehmen-Ortega(2010) summarize this as;

> "A business model depicts the mechanisms that enable a firm to create value through the value proposition to its potential customers, its value constellation, and how it captures this value to transform into profits"

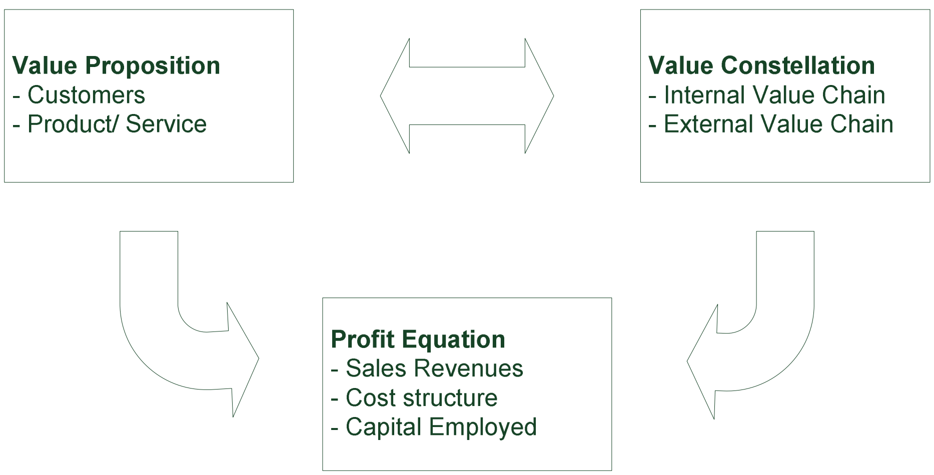


Figure 12 Interactions of Value Creation and Value Constellation (Schoettle and Lehmen-Ortega, 2011)

The selection of a business model depends of the performance of the organization in its value chain (Schoettle and Lehmen-Ortega, 2011). These four configurations are composed by the manner in which the configuration components of Wüstenhagen and Boehnke (2007) are used in the specific value chain. Wüstenhagen and Boehnke (2007) explain the composition of the components consisting of the firms value partners, value creation architecture, and strategic resources. By combining the value constellations of Schweizer (2005) with the value propositions of Schoettle and Lehmen-Ortega (2011) a matrix of all possible types of business models (14) for utilities in the PV solar system sector is composed, this identification method is extracted from Wüstenhagen and Boehnke (2008). These fourteen business models have a number of similarities which made it possible to combine their key competencies into six major strategic groups. The models can also be distinguished from each other using the framework of Osterwalder and Pigneur (2010) and are explained by Schleicher-Tappeser (2012) as the six generic business models which can be applied in the solar PV sector for utilities (see Figure 13). These six generic business models are not exclusively applicable and to increase efficiency combinations can be used at the same time (Schoettle and Lehman-Ortega, 2010). The figure below represents the six business models defined by ownership of the facility and the facility application as manner to describe the position in the market (for further explanations concerning the six business models see appendix 2.1). The position in the market is described by these two aspects because the changes of ownership is expected to be a key driver of potential market growth, and models nowadays vary in application. Application variations are the changes in the supply chain, i.e. changing financing schemes of the PV systems and services related to the product to improve efficiency (Frantzis et al., 2008). This division of the PV market is a useful tool to distinguish the different business models in the market.

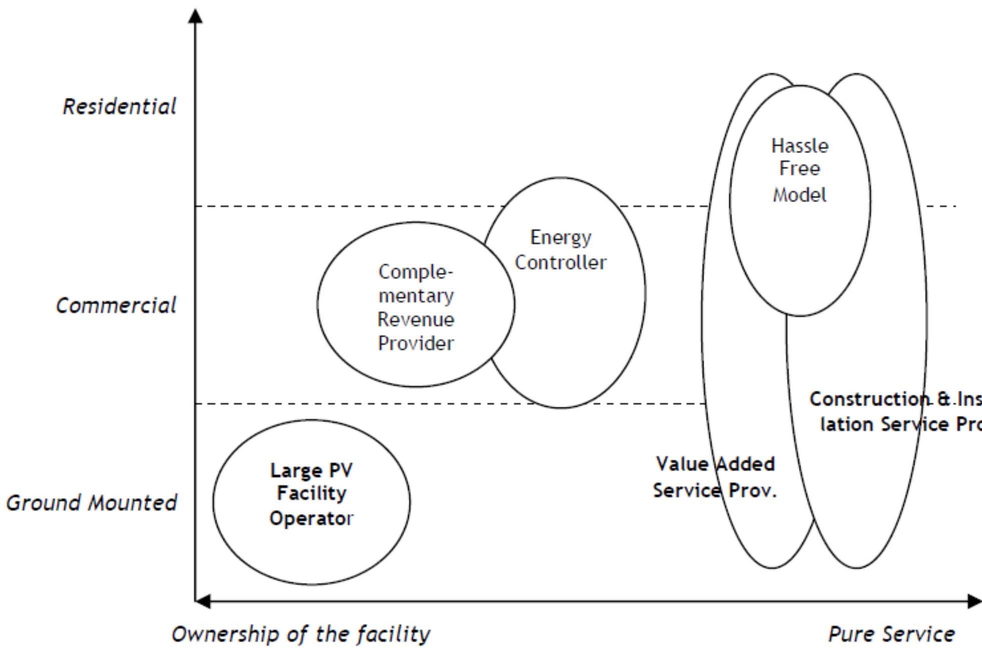


Figure 13 The Six Generic Business Models (Schoettle and Lehman-Ortega, 2010)

Other applied business models are also explained by Drury et al.(2012) and Asmus(2008) who discuss two particular situations, the use of third parties and community based programs. These business models can be categorized as first generation business models, Build-own-operate rooftop and a more value-added service provider business model (Frantzis et al., 2008; Scoettle and Lehman-Ortega, 2011). The two models are further discussed below because of their positive impact on the commercialization of the PV systems.

A new developing option to finance the purchase of a photovoltaic system is called third party PhotoVoltaics (PV) ownership. California was one of the first to implement this construction. In this rapidly growing market trend commercial companies own and operate PV systems and lease the equipment or sell the electricity generated to the inhabitant of the building where the systems is placed (Drury et al., 2012). Due to this construction the threshold of the purchase is diminished since the significant initial investment is reduced or even eliminated. Also the reduction in technology risk and complexity by monitoring the system performance can be observed as con for this construction (Drury et al., 2012). Mostly PV systems are promoted by mentioning their payback time, explained as the time in which the investment is earned back because of the cost reduction in the energy consumed. With the third-party ownership this value proposition is switched by showing cost savings on the energy starting in the first month of the ownership. With this strategy more potential customers can be convinced of the value proposition of the systems which even resulted in a significant growth in the adoption of PV systems within new demographic groups in California. A conversion of the market appeared more highly correlated to younger, less affluent, and educated populations. This finding shows an expansion of the former market rather than a larger percentage in the existing market (Drury et al., 2012). So the adoption of this strategy clearly promotes the adoption of the PV systems and expands the market.

Another newly developed manner to stimulate the feasibility of the commercialization of PV systems is the community based program. The goal of these programs is to decrease the costs of the systems by achieving economies of scale and to serve markets who did not yet implemented solar energy on a large scale (Asmus, 2008). For the community based programs the terms community solar and solar shares are used and can be explained as the manner in which a single solar PV array is installed, or series of arrays who are working in an single system, where multiple users can draw electricity from (Asmus, 2008). This system also provides solar energy for consumers who do not have the opportunity to install PV systems on their rooftops because of various reasons. The financial construction behind these community solar models offers the consumer the choice to purchase shares of the total output of the PV systems without the financial constraints of the initial investment or installation management. The two main benefits of this system resulting from the literature are the decrease in costs due to the economies of scale and the possibility of consuming solar energy without the constraint of providing space to install the systems. Another important factor that stimulate the consumption of PV systems for consumers, provided by the companies that offer these programs, is the decrease of technological risk for consumers by taking care of the installation and maintenance of the systems. This simplifies the step towards consumption what expands the potential market of PV systems, this shows the difference compared to the third-party ownership. Examples of the newly formed potential target groups are; households and firms who rent, owners who live in apartments, and house owners with other reasons why the installation of a PV system is not possible on their own roof.

2.7 Conclusion

The previous summation of the various PV business models provides a clear insight in the literature situation in 2012. With the knowledge of this theoretical background the Flemish market can be mapped and observed. Within the previous literature study various helpful findings came to light. During this research project the focus will be on a number of these findings. For most approaches their usage for this research project was already shortly mentioned. As recap the following findings in literature will have the focus in this research.

Business models influence the commercialization of renewable energy. With the help of innovative business models the barriers to commercialization of renewable energy and therefore PV systems can be overcome and a smoother diffusion of the technology in the market can be facilitated (Schleicher-Tappeser, 2012). Changes in regulation obviously cause shifts in the balance of the market and Eckhardt and Shane (2003) explain this as the source of new opportunities. Organizations can react to these new opportunities by innovating business models to expand their potential markets. The origin of the opportunities is heavily discussed in the ongoing debate of opportunity creation versus opportunity discovery (Renko et al., 2012). External factors influence the diffusion of renewable energy technologies in the market and construction of the business models (Provance et al., 2011; Schleicher-Tappeser, 2012). The main influence to the external factors are developments of the regulatory system (Schleicher-Tappeser, 2012). The governmental regulations can be divided in three general stimulation policies. The following division of the governmental regulations is extracted from the article of Ayoub and Yuji (2011): Compensation for the green certificates; Quota obligations; and Subsidies and taxation. All regulative developments will be sketched in the Flemish market to observe their impact on commercialization and therefore business model development.

The different business models in Flanders will be mapped with the help of the framework of Osterwalder and Pigneur (2010) in combination with the Board of Innovation (2012). The combination of both mapping methods is applied to be able to convey the essential information in a visual format, and because of their complementary value. The framework of Osterwalder and Pigneur (2010) is focused on the organization itself, and the Board of innovation provides a complete overview of the location of the organization in the value chain.

The model of Schoettle and Lehman-Ortega (2011) will be used to distinguish the applied business models in the Flemish market (see Figure 13). This figure is applicable because it defines the business models by ownership of the facility and the facility application as manner to describe the position in the market. With the help of this approach the different organizations in the market can easily be differentiated. The specification of the applicability of the literature for the rest of the research project is explained in the next methodology chapter.

Chapter 3. Methodology

The previous chapter provides the theoretical background needed to study the development of the Flemish PV market. The steps taken in this research project are explained in the following section. Next, the various steps of the research project taken to answer the main research will be provided:

1. A literature study to create an overview of the existing theory concerning the commercialization of renewable energy and in particular PV. And thereafter the research proposal.
2. An initial desk study to sketch the legislation, the main actors of the Flemish PV market and the business models. And the composition of interviews.
3. An general interview with the chairman of PV Flanders to confirm findings and collect additional information.
4. A follow up desk study on legislative changes and related actors.
5. Perform the interviews and map the applied business models and related legislative developments.
6. Trace the possible linkages between both developments over time.

3.1 Literature research and research proposal

To answer the main research question a number of steps needed to be taken, starting with a literature study. To provide the requested outcome of the literature study different goals have to be met. The main goal of the literature study is to select and analyze existing literature to construct an integrated and comprehensive insight in the developments of sustainable energy technologies nowadays. Most articles were found with the help of different search engines via internet. The most common ones used for this study are: web of science, Omega and Google. These engines were chosen because of their complementary search results and user friendliness. Within these engines the search started using broad terms, such as: business model innovation, sustainable business model, sustainable energy commercialization, and Photovoltaic Business models. These terms were used because of their broad scope. With the help of these terms an enormous amount of literature was found and the articles were selected.

The usefulness of the articles was determined by reading the articles' titles. The abstracts were used as final applicability check. During the literature study the search terms which were used became more subject specific. Interesting references extracted from selected articles were assessed for their applicability. Also the related articles, which were automatically suggested by Google Scholar, turned out to be very useful. This approach helped in finding new articles related to the more specific topics. The different journals were classified with the help of the impact factor via ISI web of knowledge and elsevier.com. To guarantee the quality of the selected literature a factor limit of two was applied.

After the literature study the research proposal for this project was composed. Within this research proposal theoretical background was provided using the literature study as resource. The theoretical background was a summary of the main findings of the literature study and was discussed in

Chapter 2. The research approach and the schedule of the research project were also included in the research proposal.

3.2 Desk study and procedure interview

After the composition of both the literature study and the research proposal the actual research started with an desk study to find the different actors and legislative changes in the market. Besides the articles for the literature study different other sources were consulted. As explained the primarily academic literature was used to learn the theoretical background of the research area. Thereafter a desk study was performed to create a overview of the developments and actors in the Flemish PV market. The internet was an useful tool to collect the information concerning current developments in the market and regulations, since this information was hard to find in the academic world. After the construction of the initial sketch of the Flemish legislation and actors additive information is gathered with the help of interviews.

With the help of two distinctive interviews for the various developments in the market will be researched. The first interview will be oriented to create an overview of the Flemish market actors and legislative developments. With the help of this interview and the performed desk study a number of organizations can be selected to start with the mapping of the business models. The selected organizations will be interviewed with the help of the second composed interview. The second interview will be composed with the questions to map a business model and related legislative chnages, this is further specified in section 3.5. Both interviews will follow a certain general procedure, this is explained in the next section.

3.2.1 General procedure interviews

To be able to answer the research question and its corresponding sub questions interviews were used to collect information. As explained two general interviews were developed. As preparations for the interview a general question list was composed to be able to gather all necessary information during the interview. For both types of interviews a list of standard questions was developed. The questions were composed with the help of the theoretical background of Chapter 2. The data collector's field guide of Mack et al., (2005) was used as a guidance during the process of interviewing, information gathering and processing of the qualitative data. After the preparation of the questions the next step was taken.

With the help of a desk study to gather general information the organization was studied. This information was found using the internet as main resource. The orientation of the study started with the historical background of the organization and the role of the interviewee in the company. This information increased the understanding in the organization and already gained some insights in the motivation for the foundation of the organization. The various findings of the organization over time were studied and summed in a document. The activities of the organization nowadays were also included. The information helped to prepare and specify some questions of the general interview.

The actual interview started with the agreement of the interviewee to record the conversation. The interviewee also agreed that the gained information may be used for this research. The interviewee was provided with the option to check the extracted information used for the final report. Thereafter a presentation round was started where the different parties explained their activities and personal background. The average duration of the interviews was one and a half hours. The interview was preferably performed during a visit at the organization itself, in order to create a safe atmosphere for the interviewee to discuss his business. The interview was completed with this last option for the interviewee to pitch its ideas about possible interesting insight for this research project. With the help of this snowball effect the complete the picture of the companies in the market was created. The snowball effect refers to the phenomenon where interviewees provide additional information for further research, in this case new companies to be interviewed.

After the interview was recorded and transcriptions were made. The transcription of the interview provided some extra insights which would otherwise be forgotten during the interview. After transcription of the interview the interviewee was enabled to give their preferences to receive the transcribed version of the interview.

3.3 General interview with board member PV Flanders

During the desk study the main players in the market came to light. In particular the prominent role of PV Vlaanderen within the solar energy market was one of the findings. PV Vlaanderen is the sector association of solar energy who represents the interests of all relevant organizations in the Flemish PV market (Pvvlaanderen.be, 2012). Mr. Polfliet, the CEO of the consultancy firms Zero Emission Solutions, is the chairman of PV Vlaanderen. Mr. Polfliet was introduced by one of the organizers of the Solar Future Belgium, a large conference for all solar energy in Flanders. He mentioned Mr. Polfliet as one of the pioneers within the Flemish solar energy market, who is able to provide an objective umbrella view of the Flemish market. Therefore Mr. Polfliet was chosen as the perfect candidate for an interview to sketch the Flemish PV market. Mr. Polfliet was contacted and he agreed to visit him in his office for an interview. General questions were composed as a preparation for this interview (Appendix 3.1).

The initial interview to sketch the market actors and legislative developments

The interview to sketch the market was composed with the focus on two main topics. The first topic are the different actors in the Flemish solar energy market. And the second topic are the regulative developments. Both areas are directly in contact with each other. Both areas were perfectly explained by Mr. Polfliet. He also provided a research document, created by his consulting organization Zero Emission Solutions, which was very helpful to create an insight in the policies in the Flemish market. The report was consulted as a start of broader research concerning the regulations and subsidies in Flanders. Within the interview with Mr. Polfliet the completeness of this overview was checked and additional insights were provided. Based on this interview the initial overview of the desk study was further specified and the snowballing effect helped with the improvement of the creation of a total picture of the market.

3.4 Follow up desk study

To trace the impact of the potential developments of the regulatory system a follow up desk study was used to complete the legislative developments and related actors in the market (Schleicher-Tappeser, 2012). The previous information gained during the interview with Mr. Polfliet and the initial desk study were used for the broad picture. With the follow up study the more detailed information was researched and mapped. The related actors were important to sketch to be able to complete the entire value network of a business model, as explained in the theory Chapter 2. This is required for the construction of the business models. The related actors also provide additional information to be able to understand the Flemish energy market in total.

Thereafter the different regulators within the market were contacted for an interview. Unfortunately the different parties were not available for an interview and therefore this part of the research was mostly conducted using a desk study. Additional information was extracted from the interviews.

During this part of the research project, the information providers concerning the legislation in Flanders became visible and contact information was explored. Via Bart Hedebouw, contact person of the Flemish energy agency, the importance of energy decrees was put forward. A decree is an official change to a regional law, in this case the Flemish law. All these laws are gathered in the online database codex.vandenbroele.be. This medium was consulted to map all legislative changes. After reading numerous decrees it became clear that this source was not very helpful for the creation of an overall view. This was mainly caused by the interconnectedness of all the decrees, and an enormous amount of very detailed information. To overcome this problem other sources were accessed. The VREG, CREG and Energiesparen.be were the main sources. These sources were helpful in the search for the most important legislations for the solar industry in Flanders.

During the entire selection process of the different laws and subsidizing structures the "infinity" of indirect laws caused some problems. The difficulty in the structures of most laws is that they all correspond to another law. An example of this was the finding of special laws concerning the Leasing business model. After the interview with Belfius Lease some insights were gained concerning the difficult legislative restrictions for the application of a lease construction to consumers. The laws concerning the possibility for organizations to offer leasing contracts did influence the opportunities for the development of business models in the market. Even though these laws were indirectly influencing the possible development of a business model in the solar industry if was decided to exclude these laws, considering the limited space in this thesis. Besides this example there were other laws excluded in this thesis using the same argument. Additionally to the desk study knowledge from the interviews with the different organizations in the Flemish market, was used for the composition of this chapter (see section

3.5 below). The next step was to map the actual business models, this will be discussed in the following section.

3.5 Business models

3.5.1 Interview to trace business models

After sketching the different actors and the legislative developments the next step was to trace down the different business models applied in the market. The model of Schoettle and Lehman-Ortega (2011) is used to distinguish the applied business models of the different organizations in the value chain. This figure is applicable because it defines the business models by ownership of the facility and the facility application as manner to describe the position in the market. With the help of this approach the different organizations in the market can be differentiated and the companies to be interviewed categorized. This strategy is chosen to select the companies that are preferred to be interviewed, starting with one company per category.

To map the various business models in Flanders interviews were used to collect the additive information (see Appendix 3.2). The same preparation steps were used as explained in section 3.2. A short recap: the first part of the interviews started with an introduction and the statement that all information in this interview will be confidential. After the presentation round the interviews continued with a number of introduction questions to gain a general view of the organization and employee.

The second part of the interview consisted of questions to sketch the business model of the organization. These questions were composed to gather using the mapping methods of Osterwalder and Pigneur (2010) and the Board of Innovation (2012). Both mapping methods of Osterwalder and Pigneur (2010) and the Board of Innovation (2012) provide a central role in the general interview. Within the interviews questions are composed to trace the nine building blocks of Osterwalder and Pigneur (2010) and the different streams of the Board of Innovation. As explained in the Chapter 2 the mapping methods of Osterwalder and Pigneur (2010) and the Board of Innovation (2012) are useful to gain a quick overview of business models. The combination of both mapping methods is applied to be able to convey the essential information in a visual format, and because of their complementary value.

The third part of the interview was focused on the linkage between the developments of the business models and the legislative changes. Questions were constructed to connect both the developments in a later stage of the research project. The last part of the interview was focused on the future prospects of the Flemish market and the expected position of the organization in this future market.

Selecting the organzations

Prior to the interviews the specific organizations to be interviewed needed to be selected. Because of the enormous amount of players in the Flemish market, decisions had to be made concerning this selection process. In general the selection process was focused on the largest organizations in the market applying a certain business model. This strategy was chosen since these organization applied the business model the longest and are therefore most experienced. In general the largest firm in the market was contacted and interviewed. If this firm did not cooperate, other sources besides interviews were consulted to gather the information of the business model. If this did not provide enough information to construct the applied business model, other organizations with the same business model were contacted. This last step was only necessary for the collective purchase model.

After selecting the organization the actual interviews were conducted. Some interviews turned out to be difficult to be held at the organization itself due to various reasons, in that case the interviews were conducted telephonically, at the TU/e, or DNV KEMA.

3.5.2 Positioning the business models

After the transcription of the interviews the actual mapping of the business models started. Within the interview the questions were constructed to find the input for the nine building blocks of Osterwalder and Pigneur (2010) and the transactions of the Board of Innovation. Therefore with the help of the transcribed interviews both maps were in most cases easily constructed. Sometimes the business models were more complicated and transactions were more difficult to extract from the interview. In that case the interviewee was contacted via email to clarify the missing transaction. This strategy provided all necessary information for the construction of the business models.

After mapping the different business models they were positioned in the figure of Schoettl and Lehmann-Ortega (2010). As already discussed this figure was ideal to visualize the different business models in the Flemish market. The information from the interviews was used to position the different models in the figure. This figure is constructed for three different moments in time, to visualize the developments of the business models over time. In the new figures the size of the circles represent the activities of the particular business model in the market at a certain moment in time. The three snapshots of the market are: the start of the research in 2006; the year of the major flourish of the market 2010; and the date of the first interviews September 2012. These dates were chosen since most changes in activity and business models were observed in these timeframes. The sizes of the circles do not represent exact numbers but the comparison of the activities in the previous moment in time.

3.6 Linkage BMs and Legislation

After creating the overviews of both the business model and regulative developments, the mutual linkages between both are constructed. The information for the connections between both changes were extracted from the interviews and the desk studies. As explained this information was found in the specific part within the interview which was focused on this linkage. The gathered information concerning both the developments of in the Flemish market are summed in a table and a timeline. At the end of this research project a final table was constructed with the general linkages between policy changes and business models developments. The table enables the reader to quickly observe what policy changes influenced which business model. The table uses three different policy changes based on the division of Ayoub and Yuji (2011): Compensation for the green certificates; Quota obligations; and Subsidies and taxation. This generalization is applicable for the Flemish situation since it divides the most influencing policies. After finding the connections, the conclusion concerning the commercialization of PV in the Flemish market can be drawn. Also the future prospects of the PV market in Flanders were also sketched based on the expectations of the interviewed parties.

In the following chapter the various actors in the Flemish energy market will be discussed. The knowledge of the various actors in the general energy market will provide the reader the background information needed for a total understanding of the Flemish PV market.

Chapter 4 The actors in the Flemish market

4.1 Introduction

The renewable energy market in Flanders consists of numerous actors therefore it is important to discuss these actors to be able to create the overall picture of the Flemish energy market. The Belgian market in general is complicated in many ways and different from the situation in most countries. The main reason for this complicated situation is the division of the federal state of Belgium in three regions: Flanders, Wallonia and Brussels. This partition causes a division in legislative developments and responsibilities on the various levels. Besides this division of the governmental responsibilities there are a number of organizations influencing the market. In the following section the various influencing actors in the market will be discussed, starting with the evolution of the governmental situation and the foundation of the corresponding institutions. First the general actors in the energy market will be discussed with their corresponding responsibilities; these responsibilities vary per level and have evolved over time. Then the actors that influence the consumption side of the energy market to a larger extend, for example by charging fees or restricting by regulation, are discussed into greater detail. Table 2 shows a summary of the main actors, the next section will describe these actors and their developments.

Table 2 Actors is the energy market

	Explanation	**Level**	**Liberalized**	**Organization**
Distribution system operator (DSO)	Distribution grid administrator (low Voltages < 30 kV).	Regional	No	Intercommunales and diverse distribution grid administrators
Transmission system operator (TSO)	Transmission grid administrator (High Voltage 30 to 380 kV).	Federal	No	Elia
Production / generation	Energy producer (also possible to be supplier).	International	Yes	Diverse (examples; SPE and Electrabel)
Supply	Energy supplier (also possible to be producer).	Regional	Yes	Diverse (examples; Luminus & Electrabel)
Regulation	Regulator, responsible for policy execution.	Regional/ Federal/ municipal	-	CREG (federal) and VREG (regional)
Meter organization	Organization responsible for the measurements of the electricity meter.	Municipal	Yes	Independent measurement organization

The production company or generator produces the energy in high voltage (larger than 30 kV). The transmission system operator transports the energy using the transmission grid (larger than 30 kV, high Voltage). This distribution network operator converts the high voltage into a lower voltage to distribute the energy to the customer (small and middle charge energy smaller than 30 kV, Low Voltage). Further explanations about the difference between the distribution and transmission grid are discussed in appendix Appendix 4.1: 'explanation distribution and transmission system operators'. The energy supplier is the company that sells electricity to the customers; this company can purchase energy from an energy producer or produce the energy itself. Other actors such as the Balance responsible party and the Management responsible party (or Access responsible party) are not explained into detail due to the limited influence to the consumer side of the energy market. To create a total understanding of the different actors acting in the energy market the, Figure 14 and Figure 15 visualize the market and shows their mutual connections.

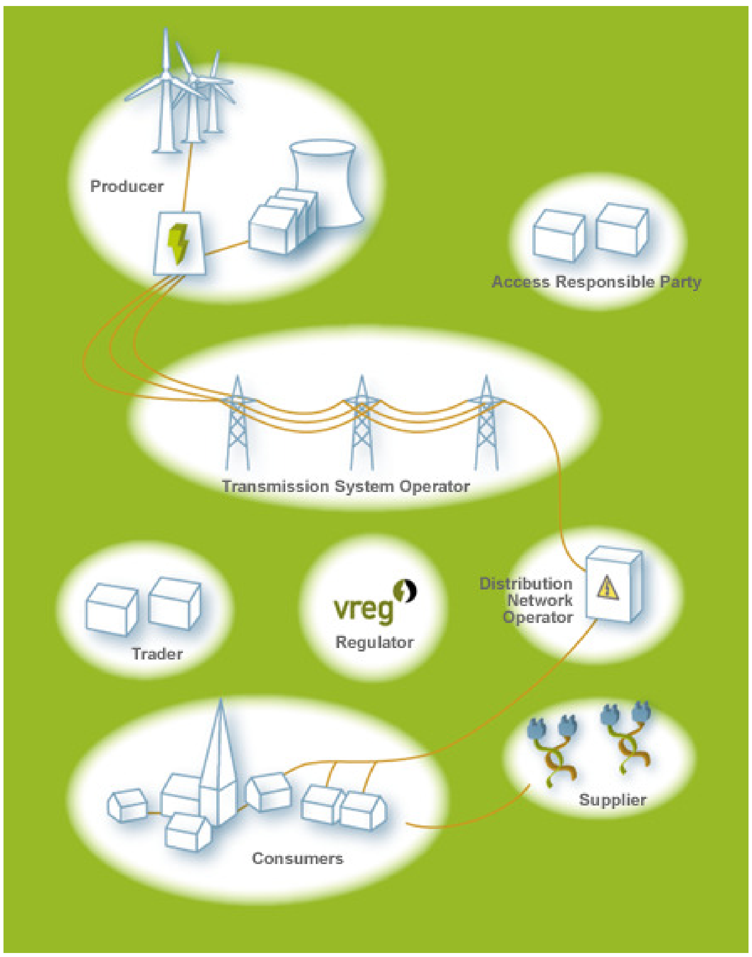


Figure 14 The Flemish energy market (Polfliet, 2012a)

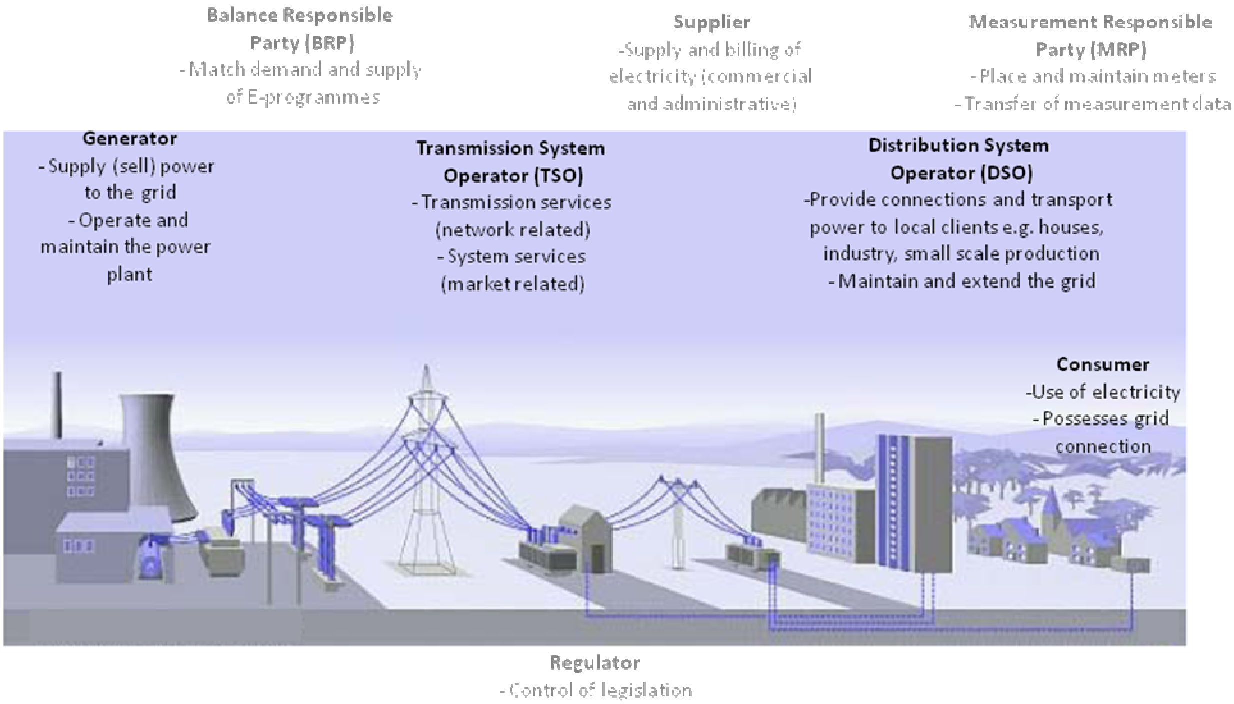


Figure 15 General overview of the system and corresponding actors (DNV KEMA, 2012)

In the following paragraphs the foundations of the different actors in the market will be described. This will enable the reader to understand the division of the different actors into the various organizations.

4.2 The governmental levels and corresponding responsibilities

The division of the federal state of Belgium into regions caused some mayor differences on legislative level. For the renewable energy market the most influencing decision was made by the federal government on the 8th of August, 1980 where a new law was adapted. This law moved full responsibility of environmental issues to the regional government (Polfliet, 2012a). From this moment on the regions became autonomously responsible for the renewable energy sector including all the legislative developments. This division resulted in a situation where three different systems where developed in the various regions which are incoherent and not able to work together directly.

The electricity law of the 29th of April, 1999 set by the federal government, adapted the legislative conditions of 1980 (Polfliet, 2012a; Vinck, 2008). This electricity law applied the issues of energy supply, transportation, transmission, production and tariff policies to the federal government (Elia.be, 2012). And the distribution, renewable energy and rational energy policies to the regional governments (Polfliet, 2012a; Vinck, 2008).

On the February 19th , 1997 the European law about the liberalization of the energy markets was adapted by the national government (Polfliet, 2012a). This adaptation made the legislative conditions in Belgium even more complicated, but provided an opportunity for the end user to freely choose their energy provider (Polfliet, 2012a). This division of the energy market due to the liberalization is further discussed in the following section 4.3, because it explains de deviation of the different actors in the Flemish market.

4.3 The Liberalization of the energy market

As introduced in the previous section the entire energy market in Europe was liberalized starting in 1997. Before the liberalization of the energy market the organizations responsible for the production, energy supply and grid administration, were owned by the governments. This caused a monopoly in the market. The European commission decided to change this structure to stimulate competition in the market. Because of the liberalization, it was possible to split the production and energy supply from the transmission and distribution. An important not is, that in this new situation, production and supply of the electricity is open for competition, while the transmission and distribution are still assigned and influenced by the government (Vinck, 2008).

4.3.1 Situation of the Belgian market before liberalization

In 1925 a division was made in the Belgian electricity market between the small and large consumption (Vinck, 2008). The supply of small consumption was solely organized by municipalities in a monopoly market. For larger purchase of energy the consumer could choose between the energy supply by a municipal organization or other energy organizations. The municipalities were also in charge of the distribution of energy.

Due to the complicated constructions in this market collaboration between the different municipalities was highly prioritized. The first communal law (communale wet) of March 1922 provided the opportunity towards collaboration and unity of public good (Vinck, 2008). The first intercommunales were formed after the introduction of this law. An intercommunale is an assembly of different municipalities who collaborate to provide the energy production, transmission, distribution and supply of energy. The intercommunales were composed by two different constructions; the “pure” solely consisting of manucipalities and the “mixed” which consist of municipalities and private organizations (Vinck, 2008). The number of private production organizations was reduced in 1990, due to a merger of the three largest companies, to one private electricity producer called Electrabel. In this merger the Belgian government tried to secure their influence on the company by implementing different intercommunales into the capital of Electrabel. The electricity sector was largely controlled by this construction and the municipal monopoly on the consumption market.

4.3.2 Steps towards liberalization on federal level

Initiated by the European committee the first steps towards the liberalization of the market were taken starting April 29th, 1999 with a new law concerning the organization of the electricity market (CREG, 2012). The first step towards liberalization was the foundation of a new organization to regulate the supervision of the energy market on January 10th, 2000 (Creg.be, 2012). This organization is called the CREG (Committee of Regulation of Electricity and Gas), and was an autonomous mechanism with legislative competences on federal level. The CREG was designated to control and assist the procedure of the liberalization of the Belgian electricity market, and fulfilled an important role during this procedure.

After assigning the committee, the different markets were clarified and renewed agreements were made to regulate the market. For the production a combination of a licensing system and a contracting procedure was chosen. Only organizations in possession of an energy production license can produce energy in Belgium. The Belgian king provides the requirements for a license, using the advice of the CREG. In the situation where the owners of the licenses are not able to meet the production requirements, the committee will announce the publication of new calls for contracting procedures. All interested parties can assign to this call to try to meet the restrictions become an energy production company.

In the new situation the transmission grid will be administrated by one organization. This administrator will be in charge of the tariffs that are applied for the connection and the use of the grid. Before recognition of the tariffs, the committee needs to provide approval for the amounts. In 2001 an independent organization was founded, called NV Systems Operator Elia ('Elia'), which was appointed as the federal transmission administrator in September 2002 (CREG, 2012; Vinck, 2008). Besides the federal transmission grid the three regions also appointed Elia for the regional transport of medium voltages between 30- 70 kV (CREG, 2012). Elia was owned by a number of shareholders. The three largest are Electrabel, SPE (Samenwerkende vennootschap voor Productie van Electriciteit) and Publi-T. Publi-T represents the municipalities, SPE the united public electricity companies and Electrabel the production organizations. On the long run the shares of these organizations in Elia will decrease till only 30% which is enough to meet the European restrictions of an independent transmission administrator, the legislative conditions for Elia are further discussed in appendix 4.2 Elia (Vinck, 2008).

The third restriction towards the liberalization of the energy market in Belgium is the independence of the distribution grid administrator. The distribution grid administrator has the restriction that is needs to be founded as a trading company (handels vennootschap) with no relation to the sale and/or production of energy. This is only accepted in the situation where production or sale is essential to the coordination activities as administrator. As explained is the grid administrator

To summarize the Developments of the liberalization of the energy market on federal level;

- The foundation of CREG, the regulator on federal level.
- Liberalization of energy production using a combination of a licensing system and contracting procedure.
- The foundation of Elia, the independent administrator of the transmission grid.
- The foundation of independent grid administrators.

4.3.3 The Flemish liberalization

On regional level the adaptations towards the liberalization of the energy market meant the commercialization of the distribution and supply of energy. As in the federal situation the Flemish government founded a new organization to regulate the liberalized energy market. This organization was called the VREG (Flemish Regulation for Electricity and Gas) and was founded in December 2001. The organization is a part of the policy domain environment, nature and energy of the Flemish government (Vreg.be, 2012). The VREG is an important source of information for the consumer and has been addressed for this research project multiple times. The VREG is in charge of the regulation, control and stimulation of the transparency of the energy market in the Flemish region. The VREG also assigns the distribution grid administrator. The role of the VREG in the particular case of the solar energy will be discussed in the next chapter.

During the liberalization of the Flemish energy market numerous legislative adaptations were made to provide a smoother implementation. Changes to the regional legislation are made using a decree; this is a Flemish law with a similar function and legal impact as laws set by the federal government. A decree is established when filing a proposal or conception (ontwerp) by the Flemish government, in Figure 16 is The process to achieve a decree shown (for further specification of the decrial process see appendix 4.3). These decrial decisions are all gathered in the database of the Flemish codex.

Figure 16 The process to achieve a decree (Bestuurszaken.be, 2012)

In the decree of May 19th, 2006 the limitations of the actions performed by the distribution grid operator are explained (VREG, 2012). The distribution grid operator is in charge of the exploitation, the maintenance and the development of the distribution grid and the publication of the tariffs for using the distribution grid. The distribution grid operator is no longer permitted to perform production activities so they needed to be separated.

The distribution grids In Flanders are in most situations totally or partly owned by a municipality or intercommunales, this is a group of municipalities. This is why the municipalities or intercommunales propose candidates to the VREG for the assignation of the grid operator. Due to this policy the municipalities maintain their influence on the newly structured market. In between 2005 and 2006 the grid administrators and the different communales, the pure and mixed communales, founded the so-called operating organizations (werkmaatschappijen) to be able to outsource the statutory and regulatory tasks (Vreg, 2007). 'Eandis' was the operating organization for the mixed sector and 'Infrax' in the pure sector. These operating organizations are in most cases a private legal corporation (privaatrechtelijke rechtspersoon) with all grid administrators as participants (Vreg, 2007). For the operating organization the same conditions were applied as for the transmission grid. A maximum total combined ownership of 30% of the shares of the distribution grid operator was applied for all producers, suppliers, intermediaries or firms that can be (in)directly linked to these organizations.

The connection to the distribution grid for energy consumption is guaranteed for every consumer. The use of the grid for injection is restricted, but allowed for large consumers who produce energy themselves and all consumers who produce green energy. For the use of the distribution grid for solely the injection of energy a supply-permission is required which are handed out by the VREG. This is a restriction to become an electricity supplier but does enables organization to enter the energy supply market. To be qualified for a supply-permission the organization needs to meet a number of criteria that are composed by the federal government in consultation with the VREG. The final realization of the liberalization of the total Flemish energy market was performed on July 1st, 2003 and in the rest of Belgium on January 1st, 2007 (Seniorennet.be, 2012). Before this date the consumers in Flanders were assigned to the electricity and gas intercommunales of the municipalities.

To summarize the steps towards the liberalization of the Flemish energy market;

- The foundation of VREG, the regulator on regional level.
- The foundation of operating organizations.
- Energy suppliers' permission is needed for energy supply, distributed by VREG.

The organizations explained in the previous section are the main actors in the Flemish energy market. For the solar energy market specifically there are a number of other organizations influencing the market. These organizations are explained in the following section; again the same conditions are used as for the selection of the actors in the previous section. Solely those actors that are notably of influence on the consumption side of the market are explained.

4.4 Organizations for solar energy

In the previous sections the developments of the Belgian energy market were explained, and an overview of the energy market and their underlying legislative constructions was provided. Other parties of importance for the PV sector, which were not directly established due to the liberalization, are discussed in the following section.

4.4.1 Sector associations

4.4.1.1 ODE

ODE is the Flemish sector association of sustainable energy in general and was founded in 1996 as a zero profit association (Ode.be, 2012). ODE is the overarching organization for the more technology specific sector associations with more than 300 members. The federation provides a discussion platform for all stakeholders of the sustainable energy market. Technology platforms as Bio-Energie platform, PV-Vlaanderen VZW (Vereneging Zonder Winstoogmerk= MGO), VWEA (Vlaamse wind-energie associatie) and Warmtepompplatform are members of ODE. One of the main goals of this overarching platform is to secure that the interests of the technology specific associations are not put in front of the general interest of the total improvement of the sustainable energy sector.

4.4.1.2 PV Vlaanderen

In 2008 the sector association BelPV of the Photovoltaic solar energy was founded to represent the interests of the organizations in the Flemish PV market. At this moment the association counts 170 members what represents 80% of the total PV market players, including all mayor suppliers, installers and producers (Ode.be, 2012). The name of the sector association recently changed to PV Vlaanderen.

The goal of this association is to stimulate the production of renewable energy with Photovoltaic systems to reduce the CO_2 footprint of consumers, institutions and enterprises (Pvvlaanderen.be, 2012). In order to meet this goal the association organizes numerous activities. The members of the association are provided with exclusive up to date information concerning newly developed regulation, market developments and subsidies. PV Vlaanderen also organizes meetings and seminars on a regularly basis to provide a platform for the different organizations, exclusively for the members. The association is the main contact for questions concerning the sector for the media and tries to spread a positive image of the sector.

Another key aspect performed by PV Vlaanderen is the organization of meetings between all mayor policy regulators in the PV market including the government, VREG and the all grid administrators. Mr.Polfliet (2012), the chairman of PV Vlaanderen, explained in an interview that this is the most important role of the federation. He stated the association to be the “voice” of the sector, by representing all the 180 organization (counting 6.000 people) in the negotiations to regulative development. The association has a lobbying task towards the positive stimulation for their members concerning supporting mechanisms, provisions of technical requirements and regulation.

4.4.1.3 Prozon

The lobbying task of PV Vlaanderen is the main reason why a new association for consumers was initiated: an association called Prozon. Prozon is actually an abbreviation of the Dutch translation for producing solar energy. Prozon is founded to represent the owners of PV systems and their interests. The interests of this sector association are slightly different than those of PV Vlaanderen since Prozon represents people who already own a PV system. These interests could vary with those of PV Vlaanderen since they represent organizations that want to stimulate an active PV market and the purchase of new systems. (I.e. an example of conflicting interests could be when a new law concerning the safety of PV systems would be introduced. Where the new systems meet the concerns but previous versions do not. For installation companies, who can implement this safety condition, this new regulation could be a new source of income, so PV Vlaanderen would lobby to stimulate this new law. Prozon would try to discourage this implementation since this will bring extra costs to the owners of PV systems).

Prozon was founded by PV Vlaanderen in 2012, because of the possible conflicting interests in the future. PV Vlaanderen planned for the association to perform on their own in the future, directed by a board of solely PV system owners (i.e. not installers or other parties). Since this association is recently founded, the number of members is still growing. In the ideal situation, in which every PV system owner would join the association, the total membership would count up till 200.000 households representing a group of 600.000 people (Polfliet, 2012b). The “voice” of this group on the negotiation table towards positive conditions of solar energy could become extremely valuable.

4.4.2 Flemish Energy Agency (VEA= Vlaams Energie Agentschap)

The VEA is the Flemish energy agency and is an autonomous agency of the Flemish ministry of environment, nature and energy. The Flemish energy agency performs and supports the process of energy policy in Flanders. The most important function is the stimulation of rational use and the sustainable production of energy. They execute policy preparation and implementation, stimulation of support mechanisms, enforcement of regulation and policy evaluation. The organization provides an enormous source of information on different levels (i.e. Energy certificates, energy saving technologies, green energy and energy policy).

4.4.3 Quest for quality

In the Flemish legislation there are no general quality requirements for a PV system or installer to meet. Quest for Quality developed the most recognized quality label in Flanders where installation companies and PV systems are labeled. They provide these labels for household grid-connected photovoltaic solar energy systems; household solar thermal applications for hot water (solar thermal), electric heat pump systems and ventilation systems with heat recovery.

Besides these organizations there are numerous other organizations in the PV market but these are not located in the downstream and ownership & operation section of the supply chain. Since these organizations are not located in the defined side of the supply chain, as discussed in the introduction of this thesis, these are not further discussed.

In the previous paragraphs the contribution of different organizations in the Flemish PV market is sketched to create a total view of the actors in the market. The organizations are discussed because of their impact on the commercialization opportunities in the market. They are therefore important to the potential development of business models. The different actors also influence the energy consumption price in Flanders. The energy consumption price is another main actor in the process of the commercialization of PV in Flanders. The composition of the energy price and the different influencing factors are therefore explained in the next paragraph.

4.5 Energy prices

The composition and level of the energy prices determine to a large extend the possibilities of solar energy in the market. This influence is created by the costs for conventional energy, since this is the competing energy price for the PV systems. The higher the energy price on the conventional market, the more interesting self-produced energy becomes. The energy price is measured in kilo Watt per hour (kWh) and depends on two main factors: the customer category and the height of six components. The customer category refers to the magnitude of consumption of energy by the customers. The energy price decreases when the consumption increases, so an energy consumption pattern is attached to the customer to be able to set the energy price. These customer consumption patterns are categorized into three general categories; consumers, enterprises and large industries, and will be further discussed in the following section 4.5.1. The second factor, the six components, is the summation of costs of the six components of which the energy price is composed, since the energy price includes a number of other components besides the production costs. The six main components are: the transmission costs; distribution costs; governmental charges; public charges; supplier costs and the contribution to renewable energy and WKK and will be discussed in detail in section 4.5.2 (Vreg.be, 2012).

4.5.1 Categorizing customers

The price of energy depends on numerous components, the energy consumption magnitude and the pattern of the customer. Within the customer patterns a main distinction is made between three general consumption patterns. These patterns are difficult to allocate to a specific customer since the consumption patterns have an enormous variation. In general though the following distinction is applied:

Consumers

The first category of customers is the households, also called the Dc customer, with an average consumption of 3.500 kWh per year. The capacity of the connection of a Dc is 4 till 9 kW and is provided using the distribution grid (i.e. low voltage <1kV)(CREG, 2012).

Enterprises

The second category is the enterprises, also called the Ic1 customers, with an average consumption of 160 MWh per year. A consumer between 20 till 500 MWh per year is a Ic1 customer and is connected to the medium voltage grid (i.e. 1-25 kV)(CREG, 2012).

Large Industries

The third category is for the large industries with high consumption patterns; in this category it is difficult to apply a general customer consumption because of the enormous variation of user profile. The consumption in this category varies for different factors as time, fluctuation and diversity of sites of consumption. The CREG applies this category for large industry customers with a consumption that exceeds 10 GW per year or with a capacity of the connection larger than 5 MW (CREG, 2012). Because of these differences the energy prices are bargained with the supplier and large contracts are constructed using the specific user profile.

Since the electricity market is liberalized it is impossible to provide an overview of the prices applied for the different categories. Due to the liberalization of the market numerous price levels by various suppliers can be observed. The prices for the large industry are bargained and therefore varie due to the fluctuating prices that even differ per hour. It was difficult to calculate an average price per kWh for the different categories but this figure shows the closest estimation calculated. To create an idea of the price of energy per category the following graph shows the average general prices applied in 2012 (Figure 17).

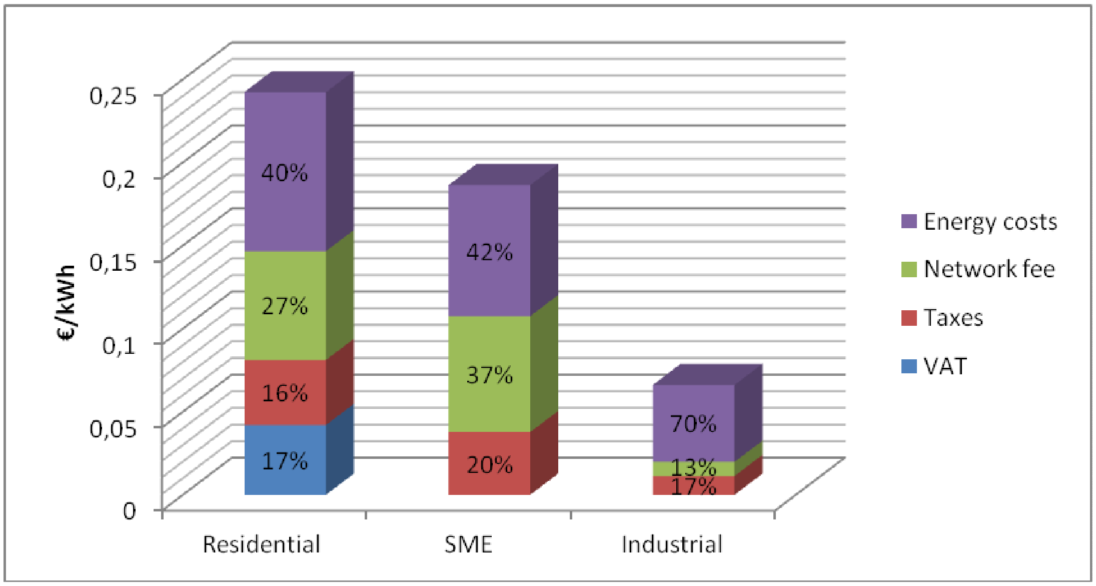


Figure 17 Electricity price differences per pattern in 2012 (€/kWh) (Creg.be, 2012; Ec.europa.eu, 2012;)

4.5.2 Energy price components

As explained in the introduction of this paragraph the energy price is composed out of six main components. In this section the components will be further described. As discussed in the previous section the prices are different for the various categories. The differences are caused by the diverse energy price applied per category but also the variation in tax obligations. In this section just the magnitude of the components for the residential (Dc) customer is discussed (i.e. shown inFigure 17). The price formulas of Electrabel Energyplus (ELEK 20) are used for the calculations of Figure 17 since the energy price also varies per supplier. Further developments and information of the energy price for Dc customers are discussed in Appendix 4.4 Energy price evolution.

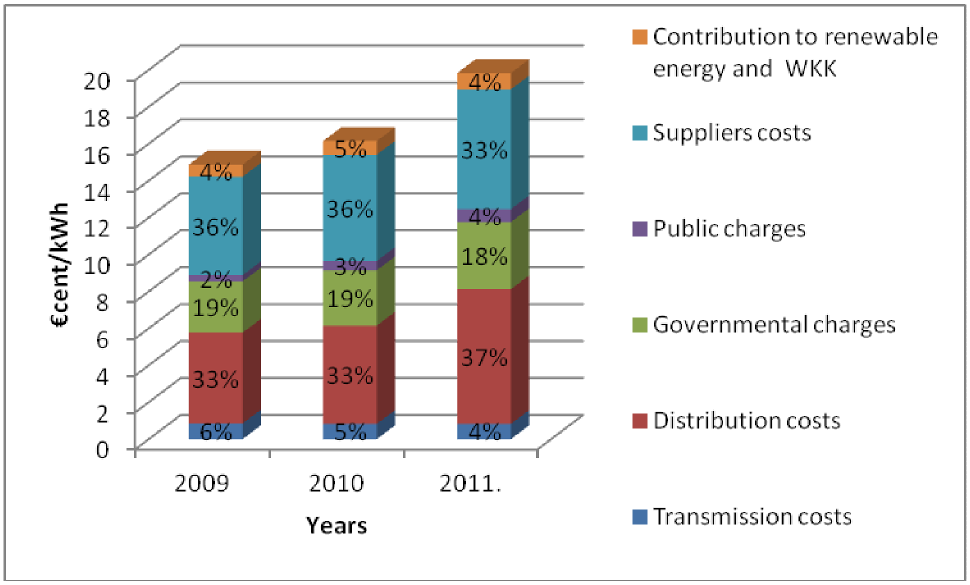


Figure 18 Energy price composition (€ cent/kWh) (CREG, 2012)

The transmission costs

The transmission costs, also called the transmission grid tariff, and is the compensation paid for the use of the high voltage grid. As explained in the previous section Elia administrates this. The tariffs are approved by CREG. Tariffs for transmission vary for the different voltages and the development over time is shown in Appendix 4.1 explanation transmission and distribution grids.

The distribution costs

The distribution costs, also called the distribution grid tariff, is the compensation paid for the use of the low voltage grid. This compensation is paid for the transportation of energy, using the distribution grid, towards the end consumer. The tariff depends on the place where the energy is transported to and is also approved by the CREG (Seniorennet.be, 2012).

Governmental charges

The governmental charges are determined by the federal, regional and local governments and concern the contribution to the energy. These charges for energy include energy contribution and federal contributions (e.g. financing the CREG, the denuclearisation of the nuclear sites, and the contribution to the social and Kyoto foundations), transportation charges, roads fee and VAT (Value Added Taxes). VAT is the tax paid to the federal government over the purchase of goods and services. VAT is by far the largest part of this component; the specification of this component is further discussed in appendix 4.5 Governmental charges (see Table 3) (VREG, 2012)

Table 3 Evolution of percentage governmental charges over total energy price for consumers (CREG, 2012)

Year	Percentage
2009	20,90%
2010	21,70%
2011	21,90%

Public charges

The public charges vary per region and are in most cases included in the governmental charges. The charges are gathered via the transmission and distribution tariff and are further explained in appendix 2.5 Governmental charges.

Suppliers costs

The suppliers' costs are the amount paid for the actual energy supply per kWh and is determined by the supplier. Since the liberalization of the Flemish energy market the costs for energy supply are differentiated per supplier. In general these energy costs are a composition of the following three components (CREG, 2012):

- The costs of the production or purchase of the electricity;
- The user profile, the amount and time of energy consumption;
- Administration costs for the supplier;

Contribution to renewable energy and WKK (warmetekrachtkoppeling)

These are the costs for the suppliers to meet the public service restrictions (i.e. cost for investments in the production of electricity concerning the sustainable energy restrictions). They cover the costs the supplying companies make to meet the governmental restrictions to stimulate the implementation of environmental methods of energy production. These costs are directly forwarded to the customers and for example consist of the extra costs made due the purchase of Green Certificates (GSC), which will be further discussed in the next chapter.

After distinguishing the various actors in the Flemish market the overall insight in the structure of the energy market is created. The overall structure will help to under understand the various regulations active in the market. The next chapter will summ the regulative developments in the PV market from 2006 till 2012.

Chapter 5. Legislation and Supporting Mechanisms

5.1 Introduction

In this chapter an overview is provided of all supporting mechanisms available in Flanders since 2006. The division of the Flemish energy market caused a diverse composition of different supporting mechanisms for the solar industry. The different mechanisms are originated from the different governmental levels; this complicates the insight in the policies. The different supporting mechanisms are originated due to various legislative developments. Most legislative developments in Flanders find their origin in European standards and conditions.

In the following chapter the supporting mechanisms and those legislations that originated the different mechanisms are discussed in the first section. A distinction is made between residential and larger firm based PV systems. The next section (5.3) the legislative developments concerning the permission to install a PV system will be discussed. And in the final paragraph of this chapter the future developments of the supporting mechanisms and legislation are discussed. The baseline conditions of 2006 are shown in Table 4. In the Figure 19, an overview is shown of all changes to the baseline legislative and subsidiairy conditions since 2006. In Table 5 all the legislative and subsidy conditions at place in January 2013 are summarized. This provides the overview of the various developments and the legislations still at place in January 2013.

Table 4 Legislative and subsidy conditions in baseline scenario (01-01-2006)

1.	GSC € 450, - for 20 years (5.2.1)
2.	Investment subsidy of the Flanders region, 10% (5.2.2)
3.	Premium local municipalities (vary per municipality) (5.2.3)
4.	Tax deduction on investment (with a maximum of € 1280,-) (5.2.4.1)
5.	VAT reduction 6% for renovation (5.2.4.2)
6.	Tax deduction on mortgage loans (5.2.4.3)
7.	Green Loans 1,5 % of total interest (5.2.4.3.1)
8.	Green energy netting (5.2.5)
9.	Ecology premium (firm base) (5.2.6.1)
10.	Investment deduction (firm base) (5.2.6.2)
11.	Building Permit (5.3)

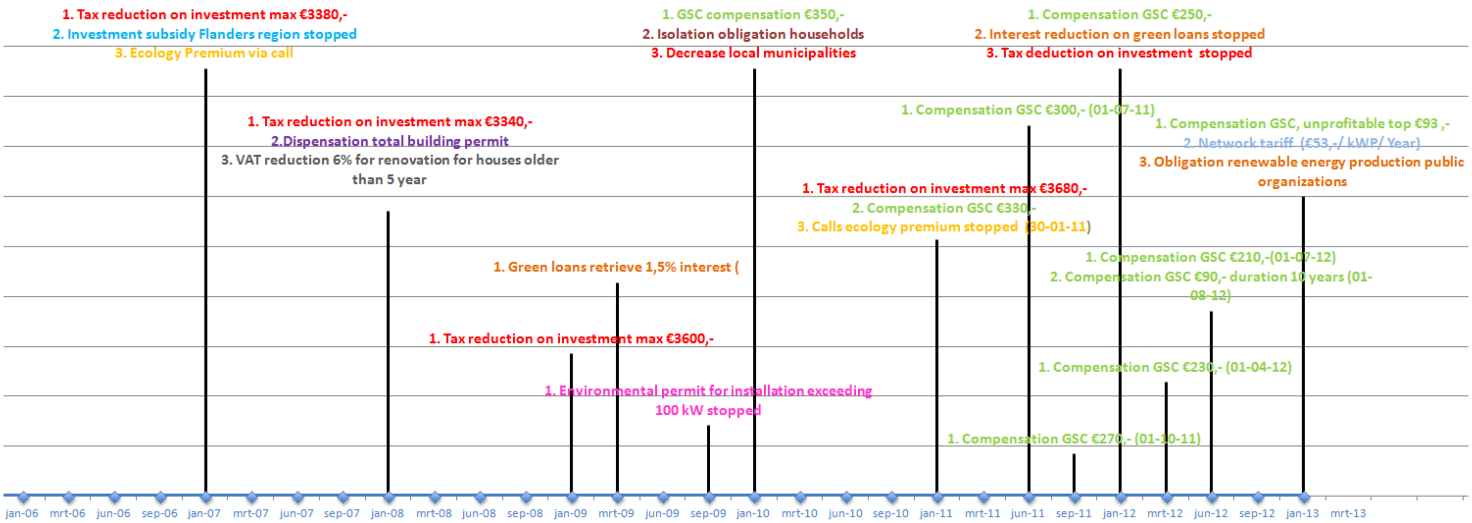


Figure 19 Timeline legislative changes 2006-2013

Table 5 Legislative and subsidy conditions in 01-01-2013

1.	GSC €93,- (Using unprofitable top)(5.2.3/ 5.4.1.1)
2.	Network Tariff (average €53, - /installed kWP/year) (5.4.2)
3.	Premium local municipalities (vary, available in ± 1/3 of the municipalities) (5.2.3)
4.	VAT reduction 6% for renovation (5.2.4.2)
5.	Tax deduction on mortgage loans and green loans (5.2.4.3)
6.	Green energy netting (5.2.5)
7.	Investment deduction (firm base)(5.2.6.2)
8.	Isolation Regulation (5.3.2)
9.	Building Permit for exceptional buildings (5.3)

5.2 Supporting mechanisms since 2006

5.2.1 Green Certificate (GSC)

The system of Green Certificates in its pure form is used in a couple of countries in Europe: Belgium, Sweden, Italy and Estonia. In the United Kingdom and Poland a variant of the general GSC mechanism was developed. The GSC mechanism in Belgium is applied in three versions in the different regions. The GSC mechanism in Flanders rewards the renewable energy producer for every 1.000 kWh energy produced with one GSC. A GSC is a certificate that proves the electricity to be produced with a specific renewable energy technology. The GSCs are only rewarded virtual and all information is saved in the online database of VREG (Vreg.be, 2012). Then the GSC can be handed in at the system operator who is obligated to purchase the GSC. The Flemish government sets a minimum compensation per GSC. The minimum compensations vary per technology that is used to produce the electricity. The specific GSC system applied in Flanders is further discussed in the following section.

5.2.1.1 GSC regulation and conditions

One step needs to be taken before the PV installation is qualified to receive the GSC for the electricity production. After the purchase and installation of a PV system, an examination is the final step before the actual energy consumption. This examination is called the AREI-examination (Algemene Reglement op de Elektrische installaties) and is an obligatory step to be performed by a recognized organization. After the completion and approval of this exam the safety of the active installation is guaranteed and the date of commissioning is set. The date of commissioning is the date of the first day the PV installation is allowed to produce electricity and the system can officially be started (Vreg.be, 2012). This final approval, and so the date of commissioning, is provided by the VREG and gives the right to be rewarded with GSC's for the production of sustainable electricity.

When the commissioning date is set the installation can be reported to the VREG. The registration needs to be performed within a year after the commissioning date to retain the right for all GSC's. For every 1.000 kWh produced electricity the corresponding GSC can be automatically sold to the system operator (i.e. for all residential systems smaller than 10 kW). In the scenario of a system larger than 10 kW the grid administrator will forward the monthly measurement to VREG (Vlaanderen.be, 2012). In both cases every GSC is handed out for the produced amount of energy. There is no distinction in reward for injected energy or consumed energy by the producer (Vlaanderen.be, 2012). The value of a GSC fluctuates over time, in which the commissioning date determines the conditions that can be applied for a specific system at that certain the moment in time. The minimum prices for the certificates are set by the regional government and vary per technology used to produce the renewable energy. In Table 6, an overview of the different technologies and its corresponding tariffs is shown. Before January 1^{st} , 2006 the minimum price of a GSC for Solar energy was 150 euro. As shown in Table 6, the price per GSC is 450 euro per GSC starting from January 1^{st}, 2006 (Pictoel, 2006). As explained the tariffs start on the date the installation is examined and running and is guaranteed for a duration of 20 years. As explained the system operator is obligated to purchase the certificates of all PV installations for the minimum price. This obligation is called the consultation liability of the system operator. The GSCs have a validity of 10 years; this is why the producer cannot revoke the consultation liability. Note that this is only applicable to those installations commissioned after June 8^{th}, 2004 (Pictoel, 2009).

Table 6 Minimum compensation technology specific per GSC (Laleman, 2009)

Technology	Minimum Price Guarantee (€/MWh)
Solar Energy (using a PV system)	450,-
Waterpower, tide and wave energy	95,-
Onshore wind energy	80,-
Organic biosubstances	80,-
Fermentation of organic- bio substances in landfills	80,-
Organic- bio parts of waste	80,-

5.2.1.2 Quota & Fines

After the purchase of the GSCs by the system operator, the GSCs can be sold on the certificate market. The value of the GSCs on this free market depends upon the quota and fines, applied by the Flemish government. The Flemish government sets quota to the energy suppliers for a minimum amount renewable energy production, the Flemish GSC system is therefore called a quantity-based approach (Laleman, 2009). The quota is set in relation to total energy supplied by the organization, and correspond to a minimal quantity of GSCs gained by the energy suppliers on yearly basis. The quota is calculated using a percentage of the total electricity sold by suppliers to the end-users (Verburgge, 2004). To calculate the quota, the system operator reports the amount of electricity provided by the supplier towards VREG. Then the VREG calculates the quota for the number of GSCs the supplier is obligated to hand in, this information is communicated towards the suppliers. Every year before March 31st the GSCs quota needs to be handed in via the online database to VREG (Vreg, 2012).

On the production side, the energy producers report all monthly information applicable to calculate the total net production and injection of electricity from renewable energy resources. Using these calculations the VREG hands out the certificates to the producers of the green energy, normally a month after the production of the electricity (Laleman, 2009; Pictoel, 2006). In section 5.4.1.2 the currently applied calculation method is further specified.

The energy supplier is stimulated to meet the quotas, every year before March 31st, by an applied penalty system. The supplier needs to obey the quota or otherwise pay the penalty of 125 euro per missing GSC (Polfliet, 2012b; Vreg, 2012). This penalty system is executed by the VREG, using the energy decree 13.3.5, which allows them to give the administrative fine. The penalty system is the direct cause of the demand for the GSCs on the certificate market (Vreg, 2012; Verburgge, 2004).

Three different approaches can be applied to meet the suppliers' quota. Firstly the energy supplier can produce renewable energy itself, to gather the number of obligatory GSCs. Another option is to purchase renewable energy from green energy producers. And the third option is to purchase GSCs on the certificate market to meet the quota. Prices on this market are lower than the minimum compensation fixed by the regional government, this will be discussed in the next section 3.2.1.3 (Laleman, 2009).

5.2.1.3 Secondary GSC market

As discussed in the previous section the fine, for not meeting the quota, is lower than the minimum compensation the system operator is obligated to pay to the producer. Therefore the prices on the trade market differentiate from the minimum compensation for GSC of solar energy. As discussed in section 5.2.1.1 and shown in Table 6 a large difference can be observed between the GSC compensation for solar energy and other renewable energy technologies. These high prices for solar energy result in a surplus of solar GSC on the certificate market (Laleman, 2009). The market mechanism is disturbed due to these high prices. Since the system operators are obligated to purchase the solar GSC, they are forced make big losses on the GSCs. All the possible linkages between the parties in the GSC market are visualized in the graph below; to create an overview of this complicated system (see Figure 20). The different transactions are explained in appendix 5.8.

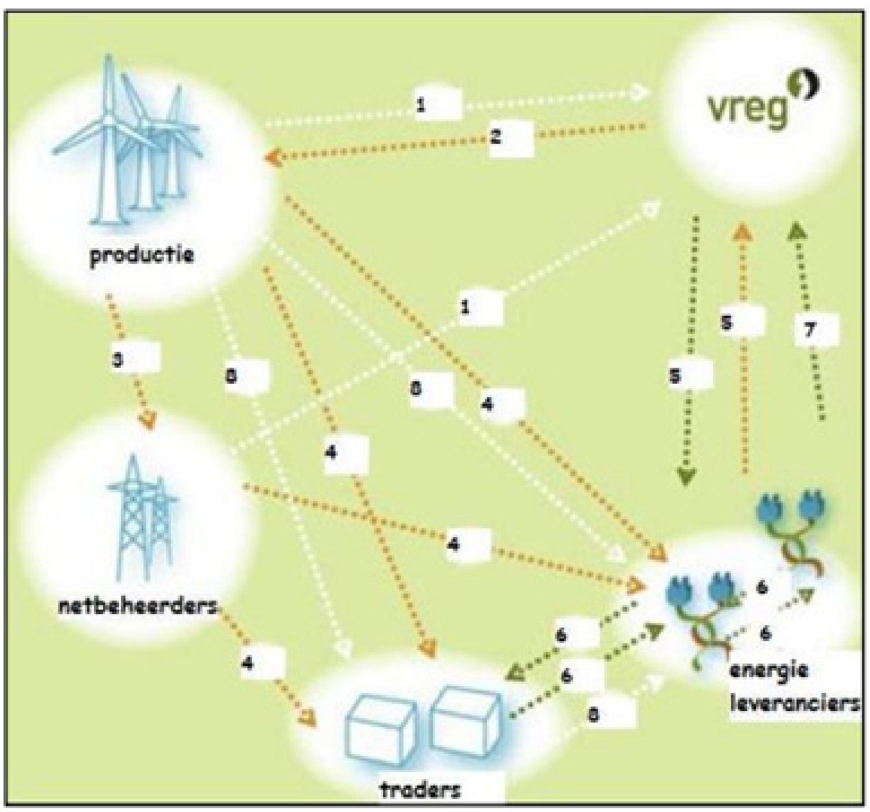


Figure 20 The 8 possible transitions of a GSC in Flanders (Polfliet, 2012a; Laleman, 2009)

Figure 20 represents the virtually secondary market which is found on the website of VREG where lists are available of the potential sellers of GSCs. All GSCs are gathered in this database and the owners of the GSCs are obligated to report to VREG when a certificate is sold. The price and the number of certificates needs to be reported, these numbers are used by VREG to calculate a monthly average purchase price per GSC. Via this website a platform is facilitated where the sellers and buyers have the possibility to connect and start negotiation concerning price and amount of the GSC's to be traded. The network operators can also sell their GSCs on this market.

The GSCs are not energy specific, this means the GSCs and its corresponding energy can be sold individually. The GSC trade is partly influenced by VAT. In the case of the administrators and producers the economical activities are subjected to VAT, but in this scenario the VAT is tax deductible. Consumers who trade in GSCs, and received the GSCs for the private production of green energy, avoid the charge of VAT. This is because these trades are not in the context of economical activities, if the yearly turnover due to the energy production does not exceed 5.580 euro's [(in the articles 2, 4 and 56 of the VAT -Law book, these activities are not mentioned as VAT - obligated)] (Vreg, 2012).

5.2.1.4 Developments GSC

Since 2006 lots op adaptations were made concerning the GSCs rewarding mechanism. However, the mechanism itself remained unchanged. In 2009 the awareness of the mechanism to overpay was growing and plans were made to control and adapt the system more to market conditions. Adaptations to the system are protected and was performed using a decree. The decree system caused a delay in the accuracy of the support system since market prices changed drastically over time. This delay caused a over- subsidized system in Flanders, this was confirmed by several interviewees (Polfliet, 2012b; Damme, 2012). Sannen (2012) gave an example of a discussion he had with the minister Veerlenbos of Flanders, where she confirmed the over-subsidy due to of the GSC mechanism.

Due to the recognition of an over-subsidy, the Flemish government adapted the GSC compensation many times over the years. As mentioned in the previous paragraph the compensation for a GSC in 2006 was €450,- per 1000 kWh. In 2010 this compensation was reduced to 350 €/MWh, also with the guaranteed duration of 20 years. In November 2010 the decision was made, still due to the presence of overpayment, to gradually decrease this compensation. In 2010 they scheduled the compensation reductions over time. Starting on the first of July 2011, a PV-system was guaranteed to receive a compensation of 300 €/MWh, still for a duration of 20 years. After the first of July 2012 every three months this compensation would decrease with 20€/MWh till the end of 2012, see Table 7 for all developments (Bouwsite.be, 2012).

Table 7 GSC value development as decided in November 2010

Date of commissioning	Minimum support per certificate (€)	Duration (Years)
01.01.2012	€ 250,-	20 Years
01.04.2012	€ 230,-	
01.07.2012	€ 210,-	
01.01.2013	€ 190,-	15 Years
01.01.2014	€ 150,-	
01.01.2015	€ 110,-	
01.01.2016	€ 90,-	

The actual applied compensation differed from these scheduled reductions. Numerous adjustments were made to come to the final agreement, which was achieved in May 2012. The majority of political parties agreed upon a policy in which the minimum payment of the GSC's was reduced within an accelerated timeframe. This decree was discussed and approved in July 2012 by the Flemish parliament. The final conclusion of this adaptation was the reduction of the compensation to 90 euro's and a reduction of the duration to 10 instead of 20 years (Vreg, 2012). In the Table 8 and Table 9, an overview is provided with the compensation for GSC's over the years for both small and larger systems. These tables show how the support mechanism was actually applied in that period of time. The fluctuating policies towards the compensation for the GSC's caused large confusion in the market. When comparing Table 8 and Table 9 the deviation with the final applied support mechanism can be observed.

Table 8 Systems smaller than 250kW (Vreg, 2012)

Date of commissioning	Minimum support per certificate (€)	Duration (Years)
2006- 2009	€450,00	20 Years
2010	€ 350,00	
January till June 2011	€ 330,00	
July till September	€ 300,00	
Oktober till December 2011	€ 270,00	
January till March 2012	€ 250,00	
April till June 2012	€ 230,00	
July 2012	€ 210,00	
August till December 2012	€ 90,00	
After 2013	€ 93,00	10 Years

Table 9 Systems larger than 250kW (Vreg, 2012)

Date of commissioning	Minimum support per certificate (€)	Duration (Years)
2006- 2009	€450,00	20 Years
2010	€ 350,00	
January till June 2011	€ 330,00	
July till September	€ 240,00	
Oktober till December 2011	€ 150,00	
January till July 2011	€ 90,00	
August till December 2012	€ 93,00	
After 2013	€ 93,00	10 Years

5.2.2 Investment subsidy of the Flanders region

In the Flemish region a subsidy is provided covering a part of the costs to purchase the PV system. The percentage of the subsidy changed from 50% of the total "investment costs" in 2005, where the VAT was is included, to 10 % in 2006 (Vandaele, L., 2004; Pictoel, 2006). This reduction was caused by the increased minimum purchase price of the GSC's for PV installations since January 1st, 2006. The increased compensation for GSC would replace the regional investment subsidy of the Flemish government. The new investment subsidy was a transitions percentage for the years 2006 and 2007 (Pictoel, 2006). A number of restrictions towards the provision of this investment subsidy were noticed. The main restriction for households is the maximum amount of potential produced energy of the PV system. This maximum is prohibited to exceed 3 kWp, on average this is produced with a surface of 24 m².

Developments

This investment subsidy of the Flemish region was totally abolished on January 1st, 2008 (Airline-airco.be, 2012).

5.2.3 Premium of local municipalities

The third available subsidy option in Flanders is the premium provided by the local municipalities. This premium is under total responsibility of the municipality and therefore the amount fluctuates between the different municipalities. In most situations compensation consists of a percentage of the investment costs, with a maximum amount between 250 and 1250 euro's per household (Dezonnestroom.be, 2008 rapport). In reality this percentage of the investment is that high that the compensation would exceed the maximum amount. This resulted in a fixed premium that can be checked at the local government (Greenpowersystems.be, 2012). It is also possible via the website of energiebesparen.be to calculate the premium available per particular municipality.

Developments

The subsidies provided by the local municipalities decreased in a fast pace starting in 2010. It is not possible to subscribe the regulations of these subsidies in general since these all differ. On average one third of the municipalities provides a sort of subsidy nowadays (Pvvlaanderen.be, 2012).

5.2.4 Possible tax deductions

5.2.4.1 Tax deduction on investment

The federal government provides the possibility to deduct a part of the purchase costs of a residential PV-system from the taxable income. This policy is originated from the possibility to deduct taxes for energy savings improvements, PV-systems is one of the options to do so. A total tax reduction of 40%, including VAT, of the purchase price of the PV-system can be achieved. Therefore the amount of the purchase price can be inserted as tax burden and fewer taxes have to be paid (Polfliet, 2012b). A maximum deductable amount of 1280 euro is set for 2006. The maximum deductable amount corresponds to a situation in which 40% of the purchase price of the system exceeds €1280,- , in this scenario the system owner can only deduct the €1280,-. This maximal deduction is usually met with the purchase of a PV system. The deduction can solely be performed in the year of purchase. If the age of the building exceeds five years the tax reduction can be spread over the first three years after the purchase of the system [(with the footnote that 40% of the value of the system exceeds the 1280 euro)] (Energiesparen.be, 2012). Other conditions are at place in case the consumer owns different green loans, these have to be taken into account when calculating the possible tax reduction.

Developments

The maximum deductable amount is indexed every year, in order to recalculate if the specific situation is still entitled to the maximum amount. In 2010 the maximum deductive amount of the purchase value was €3600,00, still using the 40% of the purchase price. The federal government changed the policy towards tax deduction in 2011 to a maximum possible deductive value of €3680,00 in 2011. These beneficial tax conditions can be applied for PV-systems installed before the 27th of November 2011. All tax deductions available for investments in energy savings improvements, except for roof isolation, were cancelled since January 1st, 2012 (Pvvlaanderen.be, 2012). In Table 10, an overview is shown of the changed amounts over the years.

Table 10 Maximum tax deduction on investment

Tax Year	Amount (€)	Source
2006	€ 1280,00	Sunpanels.be (2012)
2007	€ 3380,00	Users.telenet.be (2012)
2008	€ 3440,00	Users.telenet.be (2012)
2009	€ 3600,00	Raedus.be (2012)
2010	€ 3600,00	Energiesparen.be (2012)
2011	€ 3680,00	Energiesparen.be (2012)
2012	-	Energiesparen.be (2012)

5.2.4.2 VAT reduction 6% for renovation

Normally a VAT percentage of 21% is applied in Flanders (i.e. VAT is the tax paid to the federal government over the purchase of goods and services). An exception is made for labor-intensive services, initiated by the European commission. A list of labor-intensive sectors qualified for a VAT reduction to 6% was composed. Belgium opted towards extension of the existing list with the renovation of private homes, for buildings exceeding the age of five but less than 15 years (Federale Overheidsdienst Financiën, 2007). This option was accepted by the European commission in 2005. Therefore the renovation, and the materials needed to execute the renovation, of private homes could be performed using the reduced VAT tariff.

Similar conditions are also applicable for energy saving improvements to private homes, such as; implementation of isolation, replacements of a central heating boiler and the installation of PV panels

(Energiebesparen.be, 2012). A number of conditions have to be taken into account to be able to be qualified for this VAT reduction. The installation of the panels needs to be performed by a registered contractor and invoiced to the end user (Federale Overheidsdienst Financiën, 2007). And at the time the construction contract is made the contractor needs to be registered as independent contractor [(articles 400 and 401 of the law book of income of 1992)] (Federale Overheidsdienst Financiën, 2007).

Several conditions are applied for the purpose of the building. The main function of the building needs to be private use. A number of exceptions are made to these conditions (Federale Overheidsdienst Financiën, 2007). In the situation in which the building is party used as a private home but also for professional goals the tariffs are divided according to the usage division. The six percent tariff can be applied for the part of the building used for private activities and the other part the normal 21 percent needs to be applied. Other exceptions such as apartments and accommodations establishments have their specific conditions which are further discussed in appendix 5.2.

Developments

The decision for this VAT reduction was made in 2005 for three years, and was extended every year for the next year ever since. As discussed is the reduction depended on the age and the purpose of the renovation. The age of the building where the panels are installed must exceed five and be less than 15 years, to be able to apply the reduced VAT tariff. In 2008 this exception to the tariff changed to all buildings who exceeds the age of five years (Federale Overheidsdienst Financiën, 2008).

5.2.4.3 Tax reduction on mortgage loans

Mortgages can be used to finance the initial investment for the purchase of a PV system. At the 1st of January, 2005 a new policy was introduced concerning the tax deduction for mortgage loans (ODE-Vlaanderen, 2008). This policy enabled a personal tax deduction of all costs of a mortgage, using a tax level depending on the family conditions (ODE-Vlaanderen, 2008). These conditions can be applied to the purchase of a PV system using a mortgage to cover the investment. Three options can be applied to use the mortgage for to deduct personal taxes. The first option is to specially apply for a mortgage to finance the purchase of the PV system. The second option is to adopt the costs of the system into a new mortgage, and the third option is to extend an existing mortgage.

To apply this tax deduction a number of conditions need to be taken into account. The mortgage needs to exceeds the duration of ten years and requested for a personal home loan (Dezonnestroom.be, 2008). The personal home loan cannot be a second mortgage. The level of the tax reduction depends on the family situation and varies per tax year. Profitable condition vary per specific situation what provides an enormous selection of opportunities. These are not further specified in this thesis because of the gigantic variation in conditions and corresponding possibilities.

Developments

No important developments observable for the specific situation of loans for PV installations.

5.2.4.3.1 Green Loans

A special form of mortgages are the green loans available in Belgium. Green loans are inexpensive loans which are intended to be used for energy savings. The green loans are provided via different organizations such as banks and local entities (VAE, 2009). The federal government started on the first of January 2009 a temporary supporting mechanism for these green loans. This mechanism was implemented in the economical recovery law of march the 27th in 2009.

The mechanism provided a interest discount of 1,5% for the owner of a PV system. This enabled the owner of the green loan to retrieve 1,5 percent of his total interest from the federal government. The restitution can be applied with retroactively till the starting date of the mechanism. And the value of the loans must vary in between 1.250 and 15.000 euro's. The administration related to this mechanism is performed by the issuing organization who needs to deliver the documentation to the FOD finance. The organizations who manages the resources has to meet the collective needs of society (jobfin.be, 2012; groeneleningen.be, 2012).

Another beneficial condition of these green loans are the interests paid, these are qualified to be applied for the energy deduction. What means that the tax reduction of 40% can be applied to the yearly paid interests. This deduction is received on top of the normal energy deduction for the investment itself and has an unlimited value (groeneleningen.be, 2012).

Developments

This supporting mechanism stopped on the 31st of December 2011 (minfin.fgov.be, 2012).

5.2.5 Green energy Netting

After the installation of the PV system the next step, energy production, takes off. The production of the solar energy is logically produced during day. Energy consumption peaks in most household take place when the sun has already set, what brings the problem of energy shortage and electricity surplus. For the shortage and surplus of electricity an easy solution, electricity consumption from and injection in the normal grid is present. But difficulties concerning this process easily pop-up concerning electricity prices and usage.

The process of electricity injection into the grid, and the federal rule which obligates the suppliers to compensate the inserted amount of electricity to the same price as the consumed electricity, is called Green energy Netting. The "measurement code" (part V, article V 2.4.2) of the Technical Regulations Distribution Electricity of the VREG determines that the kWh-measuring meter can rollback when the electricity production is higher than the internal use, this for a maximum installed capacity of 10 kWP (Vandaele, 2004; ODE-Vlaanderen, 2008). In this manner is the owner of the system is compensated for the total electricity injection. The measurement of the teller takes place every tariff period, separately for the night and day teller. The majority of the households in Flanders are equipped with two different tellers, since the suppliers apply two different tariffs for day and night consumption. For every kWh "over "produced during day the dayteller is reversed. The night teller can only be reversed in the weekends since there is no energy production at night (Vreg, 2012). An energy production surplus during day cannot be used to reverse the night teller. Therefore in most situations it will be profitable to switch to a singular teller, the exact conditions depend on the supplier and consumer.

The financial compensation for consumers is on average approximately 22 cent/kWh but this amount differs over the years and time of injection (ODE-Vlaanderen, 2011). The compensation is not actually cashed since in most situations the production does not exceed the consumption of electricity. This is called the net production on yearly basis. In the situation the household does achieves a positive net injection, the supplier is not obligated to any compensation and the final energy bill will in most cases invoice a zero consumption (Vreg, 2012). The injected electricity can also be sold to the supplier but the price per kWh will be much lower than the consumption price of the electricity. The suppliers are mostly not interested in the purchase of these small amounts of electricity and are not obligatory to do so. Extra costs due to an adjustment of the kWh- meter, since this meter needs to be adapted to production measurement, can be charged at the system operator.

5.2.5.1 Large systems (> 10 kW)

For larger PV systems the situation concerning the green energy netting differs. For those systems with a transmitter exceeding 10 kW the regulation of the new Technical Regulation Distribution Electricity (Version of April 2007) in the Flemish region, prepared by the VREG, needs to be applied. For these systems two separate connections (EAN- codes) are needed. Compensation for these systems is only applicable at the moment of production (ODE-Vlaanderen, 2008). For the connection of large installations to the grid a technical study by the grid administrator is obligatory.

Another option is to sell the produced energy to an energy agent on the free market, via the separated production measurer with the different EAN- codes. The price of the energy per kWh for these larger producers needs to be bargained with the energy agent. For these larger systems injection and consumption are measured separately with a two-directional teller. This enables the systems to measure one way the net consumed electricity, wherein the consumption exceeds the production, and the other way the net produced electricity so which is directly injected into the grid. These conditions as explained in the previous section were present in 2006 and are still applied anno 2012.

Developments

No developments were observed in this area.

5.2.6 Specific conditions large systems and firm based

In the previous section a number of conditions were discussed concerning the applicability for both residential PV systems as larger PV systems (>10 kW). Most supporting conditions discussed in the previous section were not applicable for the larger PV systems. The following paragraph summarizes the conditions specially developed to support this part of the market.

5.2.6.1 Ecology premium

The ecology premium is a financial support mechanism especially developed for enterprises to compensate investments in ecological projects within the Flemish region (Agentschapondernemen, 2005). This premium is provided by the economic service department of the Flemish government and consists of a percentage of the total ecological investment (Verzijck, 2012). An ecological investment is an investment which includes: environmental projects; investments in energy areas; and investments with respect to relocation due to environmental reasons. The percentage of the ecology premium depends on numerous factors. The main distinction is made between two types of organizations; the Small and medium-sized enterprises (SME's) and the large enterprises (LE's). The criteria for the different types of organizations are further discussed in appendix 5.3. For the agricultural sector a similar premium is applied which is called VLIF (Flemish agricultural investment fund) who provides a support of 12 % (Polfliet, 2012b; Agentschapondernemen, 2010).

The investment

An investment is qualified for an ecology premium when it meets the environmental issues. This consideration excludes: the benefits of potential capacity increases; costs reductions in the first five years after implementation; and the extra products due to implementation over the same period. To calculate the net ecological investment, the extra investment is compared to the classic investment for a similar non ecological solution. The comparison is made for the same production capacity of the classical investment and a realistic environmental friendly alternative, this difference is called the ecological extra costs. Also extracted from this ecological extra costs are the potential savings and revenues due to the investment. These extra costs are calculated for the specific situation, in most cases with the use of the limitative technology list. The limitative technology list contains numerous technologies wherefore the ecological extra costs are standardized. The technologies on this list are tested using the basic European norms. For technologies mentioned on the limitative technology list these ecological extra costs are standardized as a percentage of the investment. The list increases the usability of an ecological premium for SME's.

Investments in sustainable energy, mentioned on the limitative technology list, are qualified to an ecology premium of 35% for SME's and for the LE's 25% to 70% of the investment (Vandaele, 2004). These percentages can be increased (respectively with 1,5%,3% or 5%) when the enterprise is the owner of a environmental certificate, as a ISO-14001 or EMAS-certificate. Or when the enterprise will own one of these certificates before the end of the investment program (Agentschapondernemen, 2005). The provision for the different investments has a maximum support available per investment per category. For investments in sustainable energy is a maximum ecology premium available of 3,6 million euro's (Agentschapondernemen, 2005).

The environmental investments not mentioned on the limitative technology list need to calculate the ecological extra costs. A research needs to be performed to test and list the technology before the investment is qualified for ecological premium. For every ecological investment a environmental performance factor is applied to qualify the quantitative environmental assessment of the technology. This is qualified using the environmental performance of the technology, which varies between 0,6 and 1 of the ecological extra costs. The higher the environmental friendliness of the technology the higher the factor. This factor is used in the calculations of the ecological extra costs. On 3 June 2005 a ministerial decision determined this factor to be fixed on 0,6 (Agentschapondernemen, 2005).

<u>The payment of the ecology premium</u>

After the approval of the investment and the calculation of the premium, the payment of the premium is the next step to be performed. A payment request needs to be handed in within six months after the finalization of the project for which the investment is used. For the payment of the premium a distinction is made between investments with or without engagement towards CO_2 emission reduction. For the investments with engagement towards CO_2 reduction the total payment is performed at once, for not engaged investments different steps are applied. Finally the investment needs to be deducted over a period of at least three years .

Developments

The ecology premium is set using the decree of 31st of January 2003 concerning the economical support policy, especially in chapter III concerning investments for ecology. This decree was initiated by the decision of the Flemish government to provide support to organizations for ecology investments in the Flemish region (1 October 2004 and 7 February 2005) and the ministerial decision that performs the support [(29 October 2004 and 10 December 2004 and 18 March 2005 for the limited technologies list)] (Agentschapondernemen, 2005).

The decree of 31st of January 2003 was adapted on the 16th of May 2007. In this decree a more elaborated version of the decision of the Flemish government, to grant support to enterprises for ecological premium, was provided. They decided to adjust to manner to apply for the ecology premium to call system. In this new call system there are on yearly basis three calls to which an enterprise can respond by handing in their investment project. An enterprise can only respond with one project per call. The project will be objectively assessed and the different projects applied will be ranked using this assessment. The available subsidy amount will be divided with the aid of this ranking (for additional information concerning the conditions advise Agentschapondernemen, 2010).

Till the beginning of 2011 these calls were mostly dominated by investments in PV systems but this changed on the 31st of January 2011 (Bothuyne.be , 2012). On this date the ecology premium via calls was cancelled and replaced by the ecology plus premium on the first of February 2011. In this newly initiated mechanism the possibility for PV systems to be qualified for premium diminished.

5.2.6.2 Investment deduction

An investment deduction is available for enterprises, as also at place for the consumers, for the installation of PV systems. The investment deduction for PV is the general investment deduction for energy saving investments. The financial beneficial circumstances are related to article 69 of the law book for tax earnings (WIB= Wetboek der inkomstenbelasting). This article states an enterprise to be qualified to a decreased taxable profit. The taxable profit can be reduced with an increased investment deduction for energy saving investments. This deduction is calculated for the taxable profit during time the fixed assets were received or achieved (Agentschapondernemen, 2011).

Developments

For the investments and income in 2011 and increased deduction of 13,5% can be applied. Taking the cooperation tax into account a net subsidy of 4,59% of the investment can be achieved, via a decrease in tax on the company's profit (Agentschapondernemen, 2011). In Table 11 the developments since 2010 are summed.

Table 11 Tax deductions on interest (2010-2013)(Fiscus.fgov.be (2013))

Year	Percentage
2010	15,5 %
2011	13,5%
2012	13,5%
2013	15,5 %

5.2.6.2 Non-profit Organizations (NGO)

Some special condition conditions are applied to non-profit organization, for these organizations the investments in renewable energy are difficult. Non-profit organizations in Flanders are the local governments, government institutions and NGOs, these organizations have three main obstructions in comparison to other organizations (Polfliet, 2012a);

1. NGOs cant benefit from increased financial discount on the taxable profit since they cannot generate profit.
2. NGOs cant reclaim paid VAT
3. NGOs are excluded from most support mechanisms (only for demonstration projects of VEA is it possible for an NGO to file an project)

These conditions explain the difficulty for the NGOs to invest in renewable energy, but there are a number of strategies to navigate within these restrictions. There are some supporting mechanisms applicable to specific sectors in the non-profit market and deviated constructions are constructed. Examples of these sector specific subsidies are the VIPA-subsidies for the care sector and AGION-subsidies the education sector. These are not further discussed due to the limited time for this research and the lack of additive value of these conditions.

5.3 Regulation

The regulations in Flanders underpin the various supporting mechanisms discussed in the previous sections. These and other regulations are applied in the PV sector concerning the installation of the systems are often based on European directives. In this sections the most important regulations with no relation to subsidies are discussed.

In 2006 there was no permission needed for the installation is not needed for PV-panels on flat roofs and integrated systems in the sloping roofs [(an exception to this rule are: protected or provisionally protected monuments; buildings provisionally or definitively protected landscapes on properties located in provisionally or definitively designated anchorages and heritage landscapes; on buildings located in protected or provisionally protected town and village views; on buildings in provisionally or definitively protected archaeological monuments or areas and buildings included in the inventory of the architectural heritage)] (Codex.vlaanderen.be, 2012). An integrated Solar panel in a sloping roof is directly installed on top of the roofing itself, or a couple of centimeters above, with the same slope (Codex.vlaanderen.be, 2012). The urban architectural permit is not necessary using the following conditions (the decree of 14 April 2000 article 3, point 5°,). 5° the installation of the following at buildings with permission and who are not positioned in a spatially sensitive area;

- Photovoltaic solar panels and/or solar boilers in the roof, using a maximum of 20% of the total roof surface pointed to the south, not from the total roof surface.
- Photovoltaic solar panels and/or solar boilers on a flat roof.

This are the main conditions to take in mind when installing a PV system. After 2006 a number developments occurred, these are discussed in the next sections.

5.3.1 Regulation developments since 2006

Dispensation for permits.

The regulation concerning the installation of PV systems, explained in article 3 point 5°, is adapted in 2008. This decree was adapted by the decree of 18/07/2008 which changed a number of exceptions applied in the decree of 2000. The previous decree stated that only 20% of the sloping roof can be used for the installation of PV systems without a permit (Codex.vlaanderen.be, 2012). This limitation of the old decree was modified which enabled to complete freely install systems, except for cultural historical protected buildings and area's (Codex.vlaanderen.be, 2012). The exemption for flat roofs still remains, with detached buildings of a surface of maximum of 40 m² (Pvvlaanderen.be, 2012).

An environmental permit was also necessary for PV-systems larger than 100 kWP. On 19 September 2009 the permission was also adapted in the Vlarem (Flemish regulations on environmentpermits) II legislation 12.1.2 b, due to this change it was no longer obligated to request for an environmental permission for PV-systems larger than 100 kW (Zenrenewables.be, 2012).

In 2010 an addition is made to this decree 3°, wherein solarpanels or solarboilers on a roof, till a maximum of one meter above the eaves or integrated in the sloping roof have dispensation to be installed without a permit (Pvvlaanderen.be, 2012). Also the installation on cultural habitat is possible since this decree, in this situation an authorization from the Agency Space and Heritage was necessary (Ruimtelijkeordening.be, 2012). This decree was applied on the first of December 2010.

5.3.2 New implemented regulation since 2006

Isolation of the roof 2010

Besides the AREI-examination there is one other constraint to derive a GSC, the isolation of the roof where it is build upon needs to be conform regulation. This constraint is registered in article 23 of the electricity decree and is applied for residential solar energy systems installed after the first of January 2010. This decree states that roof and/or floor underneath the solar panels needs meet the a heat consistency (Rd) restrictions of at least 3 m^2 K/W (Vlaanderen.be, 2012). The Rd-value of the used isolation material is calculated dividing the thickness of the isolation material by the lambda- value of the material;

- Rd-Value [m^2K/W] = thickness [m] / λ-value [W/mK]

In Table 12, an overview is show of all conditions available over time since the baseline in 2006. It explains the responsible party for the particular condition and distinguishes residential and large systems.

Table 12 Conditions Subsidy and Legislation

		Section	Cancelled (*Implemented)	Federal	Regional (Flanders)	Municipal
	Subsidy					
Residential (< 10 kW)	1. GSC	(5.2.3)			X	
	2. Investment subsidy of the Flanders region	(5.2.2)	01/01/2007		X	
	3. Premium Local municipalities	(5.2.3)				X
	4. Tax deduction on investment	(5.2.4.1)	01/01/2012	X		
	5. VAT reduction 6% for renovation	(5.2.4.2)		X		
	6. Tax deduction on mortgage loans	(5.2.4.3)		X		
	7. Green Loans interest reduction	(5.2.4.3.1)	31/12/2011	X		
	8. Green energy netting	(5.2.5)		X		
	Legislation					
	1. Building permit	(5.3)			X	
	2. AREI-examination	(5.2.1.1)			X	
	3. Isolation Regulation	(5.3.2)	*(*01/01/2010)*		X	
	4. Network tariff	(5.4.2)	*(*01/01/2013)*	X		
Large systems (> 10 kW)	**Subsidy**					
	1. GSC	(5.2.3)			X	
	2. Ecology premium	(5.2.6.1)	31/01/2011		X	
	3. Investment deduction	(5.2.6.2)		X		
	Legislation					
	1. Building permit	(5.3)			X	
	2. Environmental permit	(5.3.1)	19/09/2009		X	
	3. AREI-examination	(5.2.1.1)			X	
	5. Network tariff	(5.4.2)	*(*01/01/2013)*	X		

**Policy did not exist in 2006 and was implemented in (Day/Month/Year)*

5.4 Future legislative prospects 2013 & 2014

Since the rumor concerning the over- subsidies of the PV system owners was spread, lots of changes were made concerning the legislations and corresponding support mechanisms. The developments formed a situation in which different mechanisms were working simultaneously and crossing in some sections. Since 2006 many changes were made to the system, this caused lots of confusing situations. Unfortunately there is still no consistent policy concerning solar energy and even more radical changes will be implemented in the next years. Some general decisions concerning the policy in 2013 were still unclear in December 2012. In the following section future policies are explained. The developments implemented in January 2013 are also discussed in this section since the end date of this research was set on the 31st of December 2012. The developments of January 2013 are implemented in the timeline to provide the most recent overview as possible.

5.4.1 Green certificates mechanism in 2013

The GSC's mechanism, as explained in the previous section will change in many aspects. The development was motivated by the imbalanced compensation. Also explained in the previous paragraph this causes the certificates market to fail. With the help of the new Unprofitable top policy, implemented on the 1st of January 2013, the government tries to restore the market mechanism.

5.4.1.1 Unprofitable Top

The term unprofitable top refers to financial gap between production costs for grey energy and the production costs of green energy. This unprofitable top **(UT)** is calculated per specific technology used to produce the renewable energy. The mechanisms will be used as a tool to decrease the compensation differences between the different renewable energy technologies. With the help of this mechanism the GSC's are provided proportionally per applied technology. The calculation of UT is discussed in the following section; the next section will explain the applicability of this UT mechanism for the distribution of the GSC's.

The UT is the amount per unit green electricity which is necessary as additional revenue to accomplish a net present value (NPV) of zero, for an investment in an system used to produce green energy, so for $\mathbf{NPV_E\ (UT)= 0}$ (Deygere and Gauderis, 2012).

The NPV is calculated using the residential cash flow that flows to the providers of the private equity, this explains the $_E$ in the formula meaning Equity. The NPV_E is calculated with the following formula (Deygere and Gauderis, 2012):

$$- NPV_E\,(UT) = -\,E \times I + \sum_{t=0}^{T} \left[(OCF_t((UT)) - D_t - R_t) / ((1+r_e)^{\wedge}T) \right]$$

E= The share of Equity of the total investment (%)
I= Investment amount (€)
OCF_t= Operational Cash Flow after taxes in year t (€)
D_t= Repayment (Aflossen) of loan in year t (€)
R_t= Interest payment in year t (€)
$r_{e=}$ return on Equity (€)
T= economical lifespan of the project (Year)

The compensation for the UT is a part of the operational revenues. This means it is determines to what extend the providers of the private equity will achieve their required performance. For the determination of the residual cash flow for the providers of equity, the repayment and interest payment of the loan are taken into account (Deygere and Gauderis, 2012). The calculations for the UT will be repeated on yearly basis to provide an up to date UT, since the price fluctuate over time. The calculation is performed by the Flemish Energy agency (VEA). The calculations will be performed for three different sizes of PV systems, because the purchase costs vary per size what influences the outcome of the calculations. In this manner the outcome will be representative for the specific project categories (article 16, provided article 6.2/1.1). Further explanations and calculations are provided in Appendix 5.4.

As stated before the UT mechanism was introduced to reduce the differences in support for various renewable energy technologies. The calculations of the UT are used to apply the “banding” principle. The banding principle means that low cost technologies receive fewer certificates for the produced MWh and the other way around (Polfliet 2012a). This enables the more expensive technologies to generate more revenue using the support mechanism, and to come to an equal outcome as the less expensive technologies. In the UT mechanism there is no longer a reward for the produced kWh’s, but GSC’s are distributed for every € 97,- of extra production costs compared to grey energy (Polfliet, 2012b). In reality the difference with grey energy is divided by € 97,-. The result of the calculation is the amount of GSC’s available for the specific technology and is called the bandings coefficient. A maximum compensation of 1,25 GSC’s per MWh has been set.

Since July 2012 the provision of GSC’s is guaranteed for ten years, this will also changed in this new situation. The provision will be spread over 15 years, but the compensation will be calculated for ten years. This means that the bandings coefficient is calculated for ten years, but the compensation in

GSC's is spread over 15 years (Polfliet, 2012b). For example: using the UT the technology needs a compensation of one GSC every year to compete with grey energy. So over ten years ten GSC's are needed for support. These ten GSC's are not spread over ten years but over 15 years, this means the systems receives 10/15 = 2/3 (*€ 97,-) GSC's per year.

5.4.1.2 Quota calculations & Fines

As introduced in section 3.2.1.2 the GSC's mechanism is stimulated by the quota obligations of suppliers. The electricity suppliers are obligated to hand in their specified number of GSC's every year before March 31st to meet the quota and to avoid a fine. The number of required GSC's is calculated, starting on March 31st, 2013, with the following formula (See appendix 5.5 for further explanation);

- **$C= G_r * E_v * B_{tot}$**

C= number of Certificates handed in per year
E_v= Energy consumption in MWh
G_r= 0,14
B_{tot}=Total Bandings coefficient

In the situation in which the energy supplier does not meet the quota an administrative fine is given of €125,- till 31st of March 2012. Fines for 2013 will be €118,- and after 31st of March 2013 will this result in a fine of €100,- (Vreg, 2012).

5.4.2 Network Tariff per January 2013

The network tariff, or network fee, is implemented for the energy production by decentralized installations (<10 kWp) in Flanders starting at the 1st of January 2013 (Livios.be, 2013). This tariff is the amount the owner of a PV system is obligated to pay to the system operator. The fee depends on the capacity of the installation, or in case of a smart meter the injection to the grid, and the system operator. The consumer is free to choose between a fixed yearly tariff per installed capacity in kW of the installation or the payment per injected kWh. This injection can only be measured using a smart meter, which separately measures the injection and consumption. The extra costs for a smart meter are charged to the consumer. The average costs for the network tariff are 53 euro's per installed kWP/year (Livios.be, 2013, Argusactueel.be, 2013).

For installations larger than >10 kW the consumption and injection are always measured separately. The installation pays network tariffs for both the consumption as the injection (Vreg, 2013). The injection tariff is calculated and varies per installation and network operator.

Developments

In 2010 the government, via a royal decree, decided to implement an injection tariff (Hln.be, 2013). This tariff gave the distribution administrators the right to invoice a compensation for the use of the grid. In Flanders they directly applied a dispensation for this injection tariff, since they considered this policy to be contradictory to their own supporting mechanism. The decision of the Flemish government was taken to court since different parties discussed the Flemish government not to be authorized to make decisions concerning energy tariffs. The verdict of this lawsuit decided to force the Flemish government to adopt the injection tariff. The law was finally adapted in December 2012, this allowed the distribution administrators in Flanders to implements an injection tariff starting on the 1st of January 2013. This network tariff replaced the injection tariffs and is adapted as a fee to cover the costs of the system operator by the PV installations on low and medium voltages, the decree is shown in appendix 5.6 (Vreg, 2013).

5.4.3 Legislative changes in 2014

In 2014 a new law will be introduced in Belgium to stimulate the production of renewable energy. The law obligates new buildings and building that are substantially rebuilt, to produce a certain amount of renewable energy. These obligations are introduced by the European Directive Renewable Energy (2009/28/EG) and are implemented in the Flemish energy performance regulation. The decision was finally approved on the 28th of September 2012 by the Flemish government (Energiesparen.be, 2012). This new requirement is called the E-level requirement, and will be applicable to all notified rebuilding or building projects were a permit is requested. The requirment will already be in effect on the first of January 2013 for schools and offices of public organizations (Energiesparen.be, 2012).

Six renewable energy technologies are proposed to be able to meet the E-Level Requirements (E-LR). One of these six technologies needs to be implemented in the building for the production of renewable energy. For every technology there are some specific conditions set (see appendix 5.7), the owner of the building is free to choose his or her preferred technology to meet the E-level requirement. After a maximum of six months after the completion of the building a report of the E-LR- declaration will be handed in to clarify the renewable energy used in the construction of the project.
The report will be approved when the projects meets;

- All renewable energy systems are used according to the conditions;
- Or if the E-level meets the 10% stricter E-LR in developments where none of the above systems is applied or in which the plants do not meet the conditions.

If the building has none or insufficient energy production from renewable sources according to the requirements described in the appendix 5.5, the E-LR will become 10% stricter. Only if no renewable energy systems are used, according to the conditions, and if the project does not meet the stricter E-LR, an administrative fine will be provided for failure of meeting the E-LR.

In the previous paragraphs the most important governmental policies are discussed applicable for the PV installations. Except for the policies regulated from the government there is one other noteworthy stimulation activity noticeable in the renewable energy market. This will be discussed in the next paragraph.

5.5 Energy Covenants

Since the Kyoto protocol in 1997 the governments in Europe were forced to adapt their policies to decrease the overall emission of CO2. Different actions were taken on different levels, both on European, federal as regional. Belgium agreed to decrease their emission at place in 1990 with 7,5% in the period between 2008-2012 (Benchmarking.be, 2013). Different policies were developed to be able to accomplish this difficult task and since 1999 the Flemish government decided to force the organizations with large energy consumption to participate. The participation for the benchmark covenant applies a minimum energy consumption of 0,5PJ/ year, for the middle intensive industrial energy consumers the Audit covenant is in place (Benchmarking.be, 2013; Auditconvenant, 2013). The government implemented the benchmarking and audit system. This is a system where organizations agree upon a certain obligation, the agreement is called a covenant. Within the covenant the organizations obligates themselves to become a leading organizations on energy efficiency level. To become a leading organization in this field large, investments in efficiency and renewable energy are needed. As reward for this covenant the government guarantees the organizations not to be obligated to other environmental restrictions during the time span of the covenant. An experience consultant executes the benchmark and auditing of the participating organizations. The "Commission of Benchmark" was founded to execute the general coordination of the entire processes of the covenants.

The first covenant in Belgium was founded in 2003 and implemented on the 30st of June 2004. The second covenant started in January 2012. In this new covenant the energy plans of 2004 were revised and approved. The new plans of the covenant (2012) are now executed and therefore increased involvement of the participating organizations is expected in the renewable energy sector.

5.6 Findings regulative developments

During the composition of this chapter various findings were made concerning the policy patterns in Flanders and Belgium. The most obvious observation are the numerous policies influencing PV installations in Flanders. More than 20 different policies reflect on this market since the start of this research. The complicated structures and sometime the controversial interest of the different governmental layers are assembled in this chapter. During the interviews several findings concerning the policy developments also come to light. Some of these remarkable comments were discussed within this chapter. Not every interesting commented could be placed within the different sections of this chapter, therefore the most remarkable observations of the policy developments are summed in the next section.

One of the main findings during this policy research was the presence of an over-subsidy in the Flemish market. The most remarkable observation was that even the organizations in the market confirmed the existing of the over-subsidy. Various organization explained this over-subsidy to be a large influence to the development of the market. It motivated various organizations to manifest in the solar market. This over-subsidy was mostly caused by the high compensation for the GSCs mainly in between 2008 and 2011. Over-subsidy is a way of subsidy but this high that is leaded to a negative effect.

The policy concerning the GSC's was also inconsistent over the years and therefore caused a lot of confusion in the market. This inconsistency is one of the main frustrations for investors and other stakeholders in the market and is mentioned as the main obstruction for further development in the market (Polfliet, 2012b; Sannen, 2012). The inconsistency caused a troubled environment in which it is impossible to calculate the exact future prospects, this caused the obstruction for investors. The future prospect of the regulation in the market was still vague when writing this thesis. For example the regulation concerning the netwok tariff was still not specified during this research, and till a month before the actual implementation of the new regulation (in December, 2012). The formation of this law is a clear example of the complicated situation in Belgium and the difficulties attached to this construction. Since this law is newly implemented and the uncertainty of this policy is diminished the different organizations expect positive impact for the market and possible investors.

Conflicting interests due to the various layers and their corresponding responsibilities was another observation in the Flemish market. This was broadly discussed in section 5.4.2. What can be concluded from this observation is that national based regulations for the complicated manners as renewable energy are highly recommended. Lobbying was in most cases not very successful for influencing governmental decision making.

It is obvious that the various regulations influenced the Flemish solar energy market. To be able to observe the actual impact of the regulations to the diffusion of PV, the different organizations in the market need to be sketched. In this manner the regulative changes can be linked to the actual business model developments in the market. In order to create an overview of the Flemish market the different business model in this market are traced. This will be performed in the next chapter.

Chapter 6. Business models in the market

This chapter will discuss the various business models applied in the Flemish market. As discussed in the introduction, the focus of this research is on the Downstream and Ownership & Operation section of the supply chain. This is because the highest potential of occurrence of new business models in this section of the chain (Frantzis et al., 2008; Aanesen et al., 2012). The described business models are therefore only oriented in these parts of the value chain. This explains why some business models of organizations in the market are not discussed in this chapter.

As explained in the methodology chapter the business models are researched using the six generic business models of Schoettl and Lehmann-Ortega (2010) as baseline (see Figure 21). The six generic business models below are defined by two factors: ownership of the facility and the facility application as a manner to describe the position in the market. First the changes to the ownership of the facility have been and are expected to stay one of the main drivers of additional market growth for the various models. Secondly the variation in the application of the systems, since current business models mainly distinguished by the size of the system (Frantzis et al., 2008). The baseline description of Schoettl and Lehmann-Ortega (2010) is used because the different models vary on these two aspects. Therefore the visualization from this point of view clearly shows the differences between the models. The six generic business models are used as baseline but variation and deviation to these generic business models is expected. The article of Schoettl & Lehmann-Ortega (2010) solely discusses the possible business models applicable for utilities, and not all possible business models for organizations in general. Therefore it is also likely to find more business models active in the Flemish market. For this research the business models that do not fit the six generic models of Schoettl & Lehmann-Ortega (2010) will also be discussed. These variants will be discussed in paragraph 6.7. In the last paragraph a seventh generic business model will be composed and added to the figure to provide a complete visualization of the different business models in the Flemish market.

This chapter is structured using the six generic business models. Every generic model is first discussed in general; then the different sub models found in the Flemish market are described. For every sub model an example from the market is used to describe the model into more detail. Followed by the visualization of the example models, using the mapping canvas of Osterwalder & Pigneur (2010) and the tool of the Board of Innovations. Within the models of the board of innovation the GSC system and the subsidies and taxations are also visualized (i.e. subsidies and taxations as tax deductions and ecology premium etc.). The arrows in the figure visualize the responsibility of application and the party receiving the compensation. The GSC is visualized separately from the other supporting mechanisms. This separation is used because the payments of the GSC were directly used to create variations in the business models. The subsidies and taxations were not specifically visualized due to their enormous fluctuations and the lower impact to the business model. The subsidies and taxations are shown in the figure of the Board of Innovation as tax reductions since this is the largest part of these stimulations policies. The specification of the process for GSCs and subsidies and taxations is not discussed into further detail since this was already broadly discussed in the previous chapter.

The second part of the paragraph is completed with the developments of the different models experienced over time. The developments in the business models were mainly caused by changes in legislation. During this research, the different interviews provided the insight that some organizations use various business models at the same time. This is why it is possible for an organization to be mentioned in various business models.

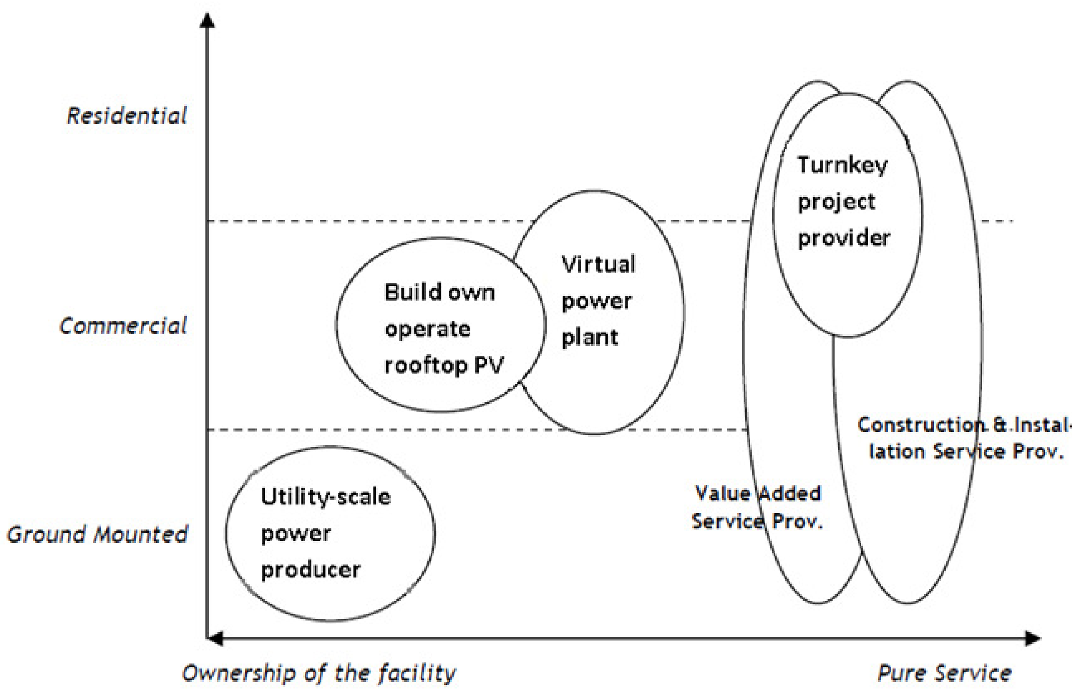


Figure 21 The six generic business models (Schoettl & Lehmann-Ortega, 2010)

6.1 Turnkey provider

The first of the six generic business models is the Turnkey provider. Within a Turnkey model the customer only has to fulfill financial obligations and the executing company will perform all other steps. The system will be totally installed and the customer only needs to "turn the key" of the installation. So within this business model the executive organization manages the entire process. The process includes the purchase of the system, the installation and the after sales service. The customer is the owner of the PV installation and pays an initial investment to purchase the installation. The model is mostly intended to be applied for customers who avoid involvement in the execution of the project, and do not want to be responsible during the process of selecting and installing the components (Schoettl & Lehmann-Ortega, 2012). The business model is applicable to customers with enough financial resources to perform the initial investment for the purchase of a PV system. Potential customers for this model will be mainly motivated by the "ontzorging" of this model. Ontzorging is a Dutch term that means taking care of all the worries concerning the purchase, installation and after sales service by the potential customer. An efficient distribution network and local project management are the required core competences of an organization that uses this business model. This business model is applied in three different variants in Flanders. The first two business models have the same customer segment which is similar to the Turnkey provider model of Schoettl &Lehmann- Ortega (2012), namely the residential installations. And the third business model is oriented to the newly found business to business (B2B) market. First the business models for residential customers are explained; next the B2B model will be explained in section 6.1.2.

6.1.1 Residential installations

The following business models can be placed in the same location as Figure 21. This means the ownership of the PV system is at the customer side (not the executive company) and the executive company is more service oriented. The B2B models are located differently in the figure; this is explained in the next paragraph 6.1.2.

6.1.1.1 Small-scale installation

The first Turnkey residential business model are the small-scale installation companies. Within this business model the executive organization facilitates all steps of the value chain. This means the management of the total process of installation and the purchase of the PV systems. The systems are provided turnkey therefore the customer solely has to fulfill the financial obligations of the initial investment. After the initial investment the customer becomes the owner of the system. The conditions for a potential targeted customer are: he/she is the owner of a roof or land where the system can be mounted to and possesses enough financial resources to be able to deal with the initial investment. This business model is also applied by utilities in the market, but they outsource the installation of the PV panels.

Twinenergy Suntile is one of the largest firms acting on the residential market in Flanders. They apply the small-scale installation business model where total service is provided towards the customers. Twinenergy has lots of experience in this market and is in charge of the purchase and import of the installations. They execute the entire process of the installation of the systems on the rooftop of the residential consumer. Their target market is solely the consumers segment. The customer is in charge of the application of the GSCs and the subsidies and taxations. The customer is also the receiver of all the financial support. In Figure 22 and Figure 23, the business model of Twinergy Suntile is shown.

Figure 22 Small-scale installation Twinergy

Key Partners

Supplier of PV panels

Key Activities

Selecting best partner for price and quality (for the purchase of the systems)
Advising task to customers
Installation of panels

Key Resources

Employees
Office & Storage
Technical knowledge
Efficient distribution channels

Value Propositions

“Ontzorging”
Reaction, speed of installing
Quality

Customer Relationships

Measurement of potential system
Creating the quote and price agreement

Channels

Telephone /internet
Traditional marketing
Face to face

Customer Segments

Consumers

Cost Structure

Labour hours for installation
Purchase of PV panels

Revenue Streams

Income from installation
Profit on purchase of PV panels

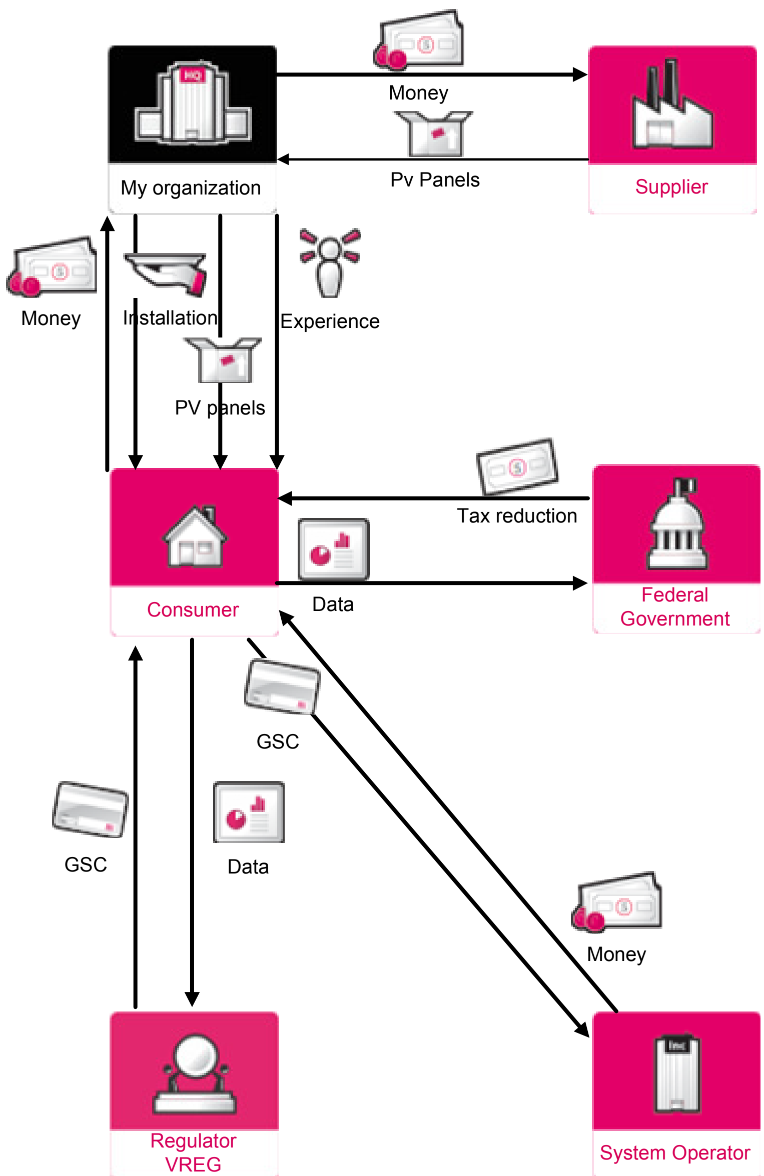


Figure 23 Small-scale installation Twinergy

Development of business model over time

Twinergy Suntile was founded in 2004 in Beerse and started on local scale. Since 2004 they expanded their market and now they are active in entire Belgium. They started their organization using the small-scale installation business model. In 2009, the organization decided to adapt their business model drastically. They implemented a newly developed business model and provided PV systems for residential applications without the need of large initial investments. In this model the customer solely needed to pay an initial investment as much as the VAT of the total purchase and the installation of the system. In 2009 this VAT for renovation, and therefore the installation of PV for buildings older than 5 year, was 6%. Twinergy managed the rest of the initial investment. Twinergy owned the PV systems what provided them with the right to receive the GSCs. This business model was profitable solely due to the high compensation of the GSCs; the investment of Twinergy was breakeven after 11 years. The customer could benefit from the other tax advantages and the consumption of free green electricity (after the small initial investment). This model was also called the lease system but can better be explained as the renting of PV panels (Belfius, 2013). The construction is comparable to the Leasing business model which will be explained in section 6.2.2, but in this model the consumer did not receive a monthly fee for the rental of their roof but does receive free electricity. Actual leasing for consumers in Belgium is linked to very strict regulation to protect the consumer in these lease constructions. The regulations were also one of the arguments of Belfius, a large bank in Belgium that offers the Leasing model for businesses, not to enter this consumer leasing market. Twinergy was able to offer this construction due to the high compensation for the GSC and therefore this business model was only applicable till the end of 2010. After 2010 they returned to the former Small-scale installation model, which is still in place today.

6.1.1.2 Collective purchases

The second residential oriented Turnkey business model is the collective purchases business model. This business model is applied by a number of organizations in the market. The business model is build upon the idea of economies of scale (i.e. the larger the quantity the lower the costs of the product). In this business model numerous residential customers are gathered by one organization. This strategy is used in order to bundle their purchases to collectively increase their bargaining power to lower the total costs. Besides the decreased costs, information service and total implementation of the system are provided, which will decrease the worries of the customer (“ontzorging”).

Zero Emission Solutions (ZES) is an organization that performed a collective purchase for 300 residential customers in, a municipality in Flanders Aalst, in 2011. ZES is a consultant in sustainable energy with lots of experience in the solar industry. This project was initiated by the municipality and can therefore be explained as a top down stimulation. They were contacted by the municipality of Aalst because of their reputation in the solar industry. ZES launched a website where the different potential customers could apply for the collective purchase. For the enrollment the customers were asked to provide them with the measurements of the size of the potential installation. With the help of this information ZES was able to calculate the price for which the panels were offered. Then ZES performed a research to find the best company to be in charge of the installation and purchase of the PV systems. Due to their independent judgment, concerning the potential installation company, ZES was able to find the ideal partner for this project (i.e. the best ratio between the price and quality). After the selection of the partner, the potential installation information was exchanged to the partner. The installation company then started to specify the installations per potential customer. During the entire process ZES provided the customers with information meetings, helpdesk and random quality tests during installation of the systems. The payments for the installation were directed towards the installation company and therefore ZES was compensated for their effort by the installer. There was no financial support from the municipal for this project. After the installation of the systems the installer was in charge of the application for GSCs and the subsidies and taxations. ZES helped the installer when difficulties during the application process showed up. The customer receives all the financial support. In Figure 24 and Figure 25, the business model of ZES is shown.

Figure 24 Business model Collective Purchase ZES

Key Partners
Installer and purchasers of PV panels (Soleco)
Municipality Aalst

Key Activities
Selecting best partner for price and quality
Advising task to customers
Unpredicted quality checks

Key Resources
Technical information of potential customers
Quality expertise/ knowledge

Value Propositions
"Ontzorging"
lower costs for customer
After sales service (6 months)
Impartial judgment

Customer Relationships
7 information meetings
Provision of information till 6 months after installation

Channels
Information meetings
Telephone/ Website
Local advertisement/ media

Customer Segments
Consumers

Cost Structure
Labor hours for information provision
Quality checks

Revenue Streams
Fixed amount per customer for Zero Emission Solutions received from installer

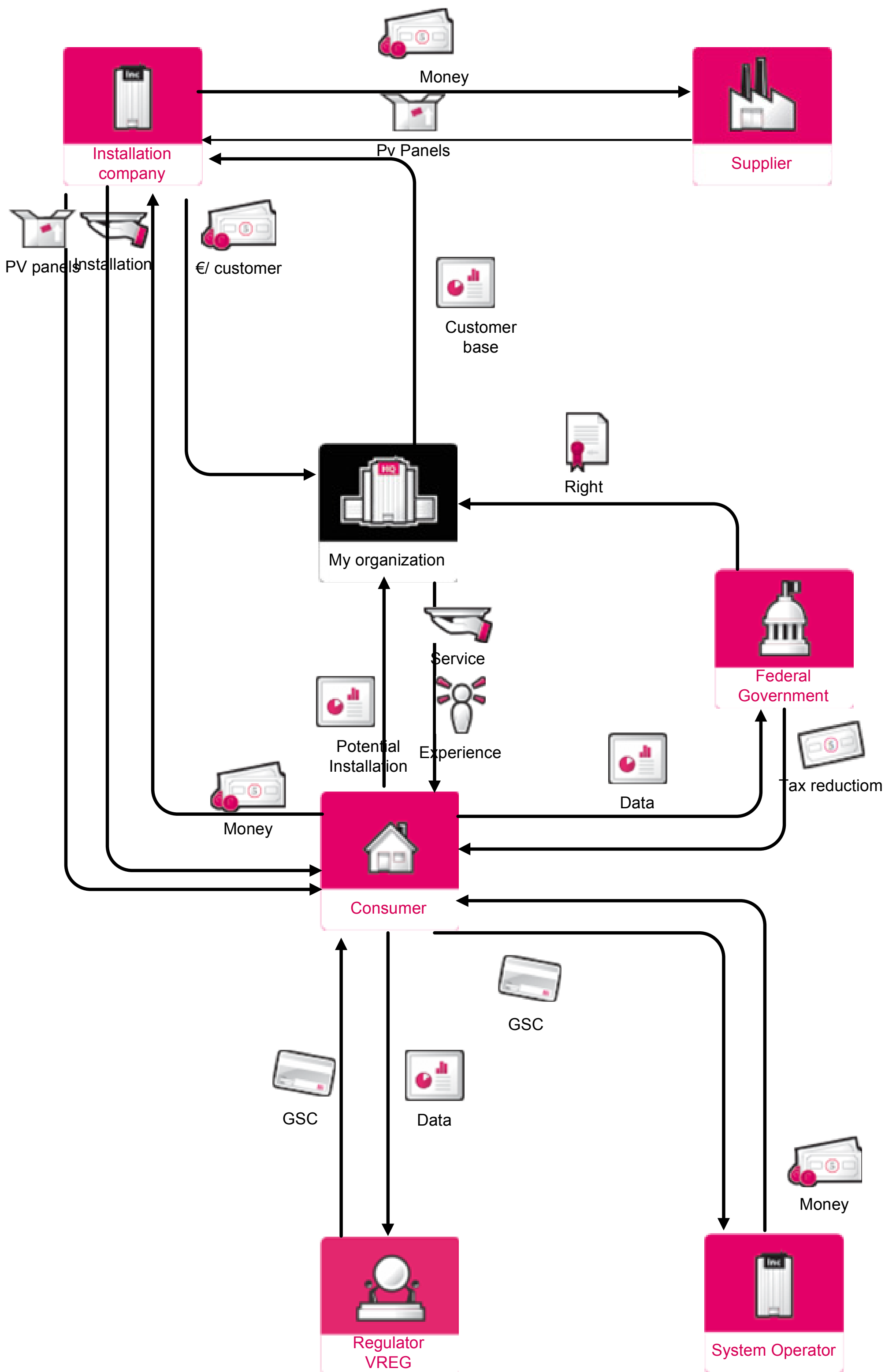


Figure 25 Collective Purchase Business Model ZES

Development of business model over time

The collective purchase project by ZES was only performed once. The CEO of ZES explained the uniqueness of the project using different arguments. The first reason was the feasibility of this project for the company, because of the location of ZES is in the same municipality. This enabled them to perform the quality checks and the information meetings without large travelling distance. The optimized relations in the region were another reason. This enabled the organization to perform the project for a competing price, was another important issue. He also explained the usual focus of ZES not to be in the consumers market, the project was accepted as a favor to the municipality. Other companies did overcome these general obstructions for further implementation, since they performed the collective purchases several times on different locations. ZES also gave some general explanations to provide a more general view of the possibilities and developments for the collective purchase model. They state this business model is to become more applicable in the future, because of the fact that subsidies decrease which increases the importance of the costs of the system. Also the new law, which will be adopted in 2014 and obligates the owners of a newly build house to implement a certain percentage of renewable energy (explained in chapter 5), is expected to stimulate the potential use of the business model.

6.1.2 B2B (Business to Business)

The third Turnkey model is the B2B model and is solely oriented to large installations (> 250 kV). The model is used in Flanders by numerous organizations. This business model is also applied by the utilities in the market. Within the model the executive organization performs the entire management of the purchase, installation and maintenance of the installations. However variation is observed between organizations performing the installation and purchase themselves, and organizations outsourcing these steps of the project. After the completion of the initial investment the customer owns the system. The potential targeted customer is financially capable to deal with the initial investment, owns mounting possibilities (i.e. roof, land) and is not capable to manage the project. The core competences of an organization in this sector are the project management and an optimized distribution network. This business model is located in Figure 21 in the Turnkey circle but a downward extension to this circle was needed to totally include the B2B model (see section 6.8).

Enfinity applies the B2B business model. Enfinity is mainly focused on the development of the project using their expertise to manage this properly. They manage and optimize the provision of customer specific materials and technologies, local partners, and maintenance. Enfinity also performs research on the optimization of the installations to achieve the highest efficiency possible. They purchase the systems themself but actual installation of the systems is outsourced. Safety of the installation is of major importance in the model. Research is performed to find the best partners for the actual installation of the systems. The customer performs the application for the GSCs and the subsidies and taxations. The customer also receives all the financial support. In Figure 26 and Figure 27, the business model of Enfinity is visualized.

Figure 26 B2B Enfinity

<table>
<tr>
<td rowspan="2">Key Partners
Installation companies
Suppliers of the systems</td>
<td>Key Activities
Efficient purchase of the systems
Project management</td>
<td rowspan="2">Value Propositions
“Ontzorging”
Fast processed due to stock and efficient channels
After sales service
20 years warrantee on system</td>
<td>Customer Relationships
Providing quotes
After sales service/ maintenance
Safety consultation</td>
<td rowspan="2">Customer Segments
Solely B2B</td>
</tr>
<tr>
<td>Key Resources
Market knowledge
Efficient resource network
Employees with expertise and knowledge</td>
<td>Channels
Direct contact
Sales and marketing employees
Website/ telephone</td>
</tr>
<tr>
<td colspan="3">Cost Structure
Labor hours for management
Outsourcing of installation
Purchase of systems</td>
<td colspan="2">Revenue Streams
Fixed amount for the installation of the PV systems
Fixed amount per year maintenance</td>
</tr>
</table>

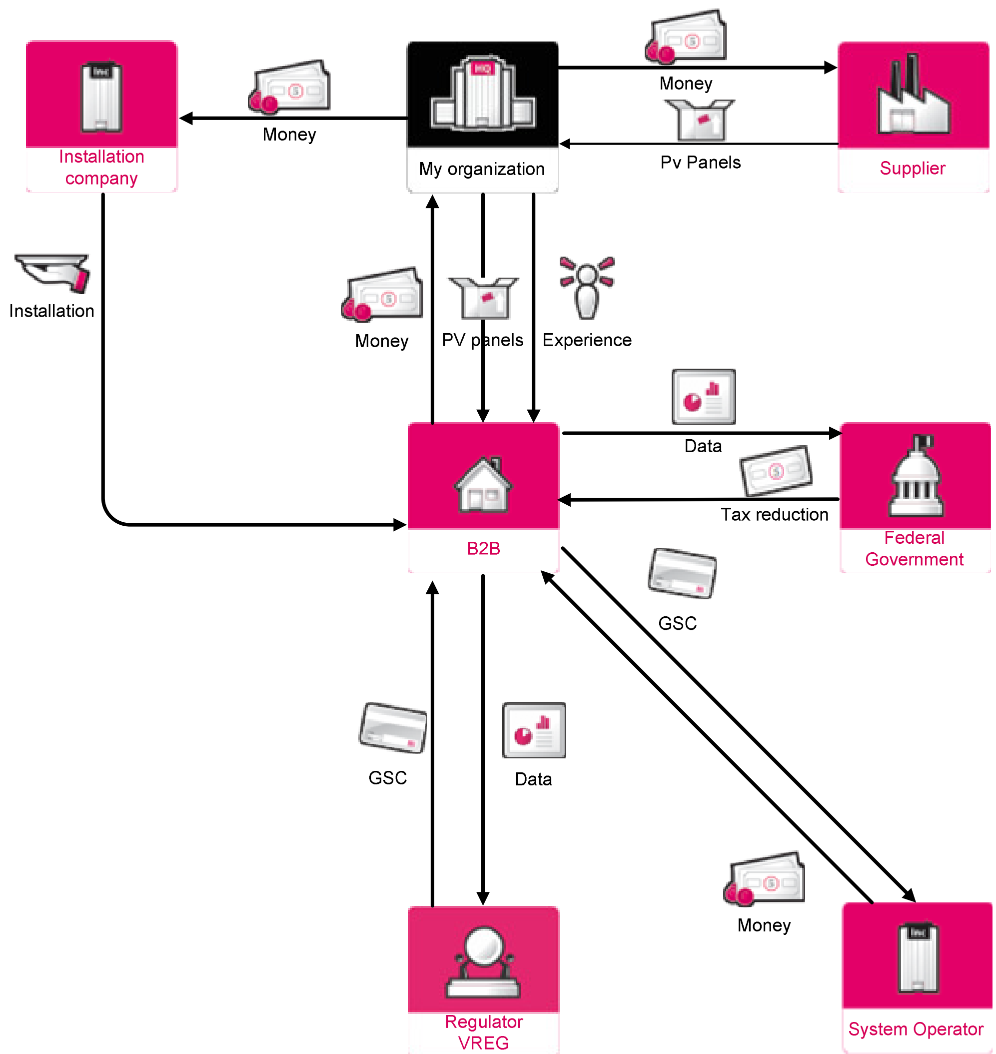


Figure 27 B2B Enfinity

Development of business model over time

This business model was applied since 2006 when several organizations were entering the solar market. In the beginning Enfinity focused on projects exceeding 250 kWP, because these projects where the most efficient. Also adaptions to the organization itself were made, which started in 2009. These adaptations were directly caused by the declining compensation for GSCs. The systems needed to be installed before the newly introduced GSC tariffs, to be able to benefit from the largest compensation. This resulted in order peaks at the end of every decline of compensation. At first the compensation of GSCs declined on a yearly basis, with corresponding ordering peak. Then the GSC policy decreased its declining time to three months, which resulted in order peaks at the end of every three months. The shifts in peaks demanded some mayor management transitions to the organization. In particular the dynamics of the purchase and sales system changed. Stocks needed to be able to anticipate to the rapidly approaching deadlines. These developments were also observed in the other business models applied by Enfinity.

Since July 2012 the large B2B market almost diminished. The number of new similar projects decreased drastically, which was directly the result of the declined compensation for GSCs (90 €/kWh). The financial conditions decreased but the systems are still profitable over the long run. Unfortunately the market is not yet able to recognize this. The CEO of Solar Acces explained the reaction of the market; he stated "jumping in a tepid bath after a warm bath, feels like jumping in a cold bath". Therefore Enfinity explains future developments mainly being oriented towards change in mindset of the Flemish potential customers. A shift from using PV systems as an investment tool to the application of PV systems as a product compatible with the existing technologies is therefore required. Enfinity states that it is hard to convince potential customers of the beneficial financial conditions, which are still at place for implementation of PV systems in Flanders.

In 2012 the orientation of Enfinity shifted towards smaller installations of 10 till 250 kWP. Enfinity was forced into this direction because the installations exceeding the 250 kWP were not profitable anymore. Previously they were able to receive the largest profits with this orientation. The economies of scale provided them with low implementation costs and the GSCs covered the difference in electricity prices. But due to the decreased GSC Enfinity was no longer able to compete with the low energy prices of large consumers. The smaller installations can compete with higher electricity prices and are therefore more interesting. In particular school buildings are now the main target group. Schools purchase electricity to higher prices and are able to make use of green energy netting. Therefore the business model in this section is still profitable but the market is small. A similar explanation for the shift to schools is provided by other organizations in the market.

For the larger systems Enfinity is now mainly focusing on other countries since this part of the Flemish B2B market is "dead" at the moment. Enfinity is waiting for improved conditions in the Flemish market and expects this market to resume in the beginning of 2013. At the moment of the interview there was still uncertainty concerning the legislative conditions in 2013. Policies such as the unprofitable top and injection tariff are expected to be implemented in 2013. Therefore Enfinity expects the rise of new possibilities and approaches for the B2B market starting in 2013.

6.2 Build-own-operate rooftop PV

The next generic business model is the build-own-operate rooftop PV business model. Within this model the organization is in charge of all the steps in the value chain. This process includes the purchase, the installation and operation and maintenance of the systems. The executive organization is the owner of the facility and is acting as an energy producer. The firm itself does not own the location to which the system is mounted. The target customers of this model are the owners of the locations and nearby electricity consumers. The organizations need to convince the owner of the location to rent their surface to be able to mount and install the system. The roof or land owner will benefit from different beneficial conditions of the system, such as: monthly received rent, the complementary green electricity, and optional discounts per kWh. In Flanders this business model is solely applied to commercial institutions (i.e. B2B). The build-own-operate rooftop PV business model is located in the commercial area on the ownership of the facility side of Figure 21.

6.2.1 Renting Formula

Enfinity also applies this second generic business model which they call the Renting Formula. The renting formula is very similar to the generic business model. The executive company is the owner of the installation and the company rents the location to mount the PV systems to. The rental of the roofs is executed using the right of superficies “recht van opstal”(RVO), and guarantees the right to rent the location for a fixed number of years. The agreement of the RVO is signed before the actual installation of the system to guarantee a safe investment. The duration of the RVO is 20 to 25 years, which is similar to the expected lifetime of the system. Enfinity applies this business model solely for roof mounted systems. Other parties in Flanders also perform this business model for ground mounted systems (e.g. Solar Acces). The conditions Enfinity applies for the location are as follows: for a flat roof at least 2.500 m^2 and for a sloping roof 1.000 m^2. The other conditions of this business model remain the same as in the B2B model. This means the installation is outsourced and the firm is in charge of the purchase of the systems, with a main focus on efficiency.

One other main component for this business model is the management of the financial streams and models, because external partners are used to finance the projects. Therefore, the level of investor interest is an important factor in the feasibility of this business model. Enfinity employs special teams who are solely focused on the development of these financial models. The teams make the projects feasible, by providing enough profits for the investors. The revenues for Enfinity are generated from the sale of the electricity per kWh and income from the GSCs. In this model the roof owner changes its normal costs for the maintenance of its possession to a positive financial stream. The owner of the roof receives a monthly fee and is able to purchase the electricity for lower prices up to 30% of the normal electricity costs (Enfinity.be, 2012). After the expiration of the contract Enfinity removes the system. Enfinity also offers a possibility to purchase the system after the expiration of the RVO. The application for the GSCs and the other governmental stimulations are performed and cashed by Enfinity. In Figure 28 and Figure 29 Figure 21, the renting business model of Enfinity is shown.

Figure 28 Renting Business model of Enfinity

Key Partners
Installati
on companies
Suppliers of panels
Investors

Key Activities
Purchasing
systems
Project management
Financial constructions
Research on efficiency
and positioning of
systems

Key Resources
Efficient
resource
channels & network
Capital for investment
Expertise in project
management

Value Propositions
Roof owner:
Decreased electricity
costs
Income due to rent

Investor:
Secured investment

Customer Relationships
Roof owner:
Operation and
Maintenance
RVO 20 years

Investor:
Meetings

Channels
Direct
contact
Website/ telephone
Sales & maintenance
personnel

Customer Segments
B2B

Cost Structure
Labor hours for management
Purchase of panels
Outsourcing of installation
Initial investment installation (Loans)
The rent of the roof

Revenue Streams
Electricity purchase (€/ kWh)
Income by GSCs
subsidies and taxations

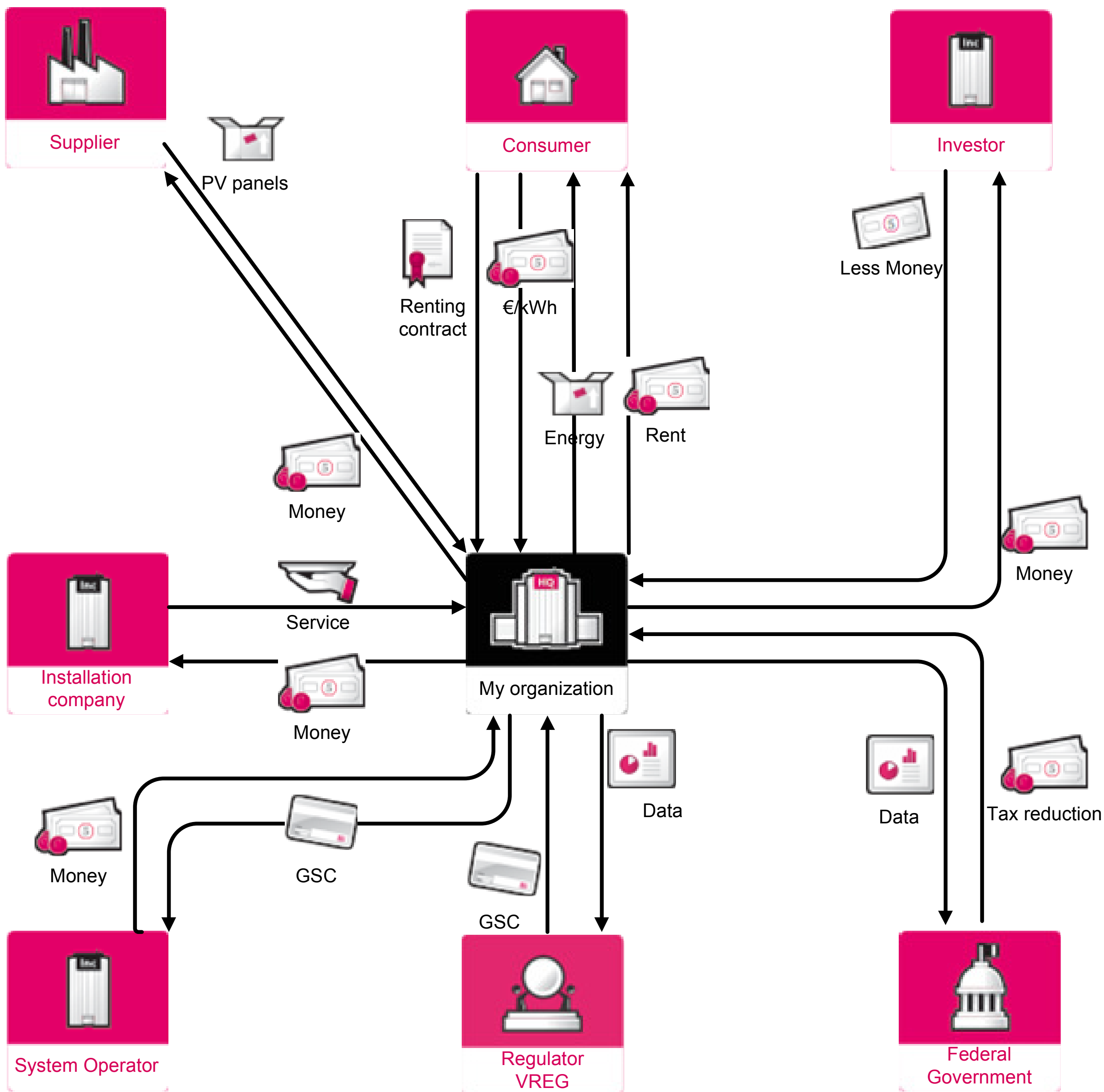


Figure 29 Renting Business model of Enfinity

Development of business model over time

Enfinity started in 2006 with the renting formula. The renting formula was mainly initiated because of the implementation of the GSCs. Their focus of the target group changed over time. The shift was caused by the decreased interest for larger installations from the market, as explained in the B2B model. After the major reductions of the GSCs in 2012 most competitors of Enfinity stopped with the provision of this model. Enfinity is one of the last firms on the Flemish market still able to offer this construction, but with the side note that optimal conditions are required.

In the renting model explained above financial benefit was generated for both the organization and customer. The financial benefit for the customer was realized by providing decreased electricity prices and the rent for the roof or land the systems were mounted to. After the reduction of the GSC most organizations were not able to provide the customer with the decreased electricity costs and therefore with beneficial financial circumstances. In the future various organizations expect to be able to apply an adapted version of this model again. But in this adapted situation the potential customer will have to agree with similar electricity costs per kWh as applied for grey energy and no rent. The value proposition of the organization will shift to the supply of renewable energy instead of grey energy. The companies expect an increased demand in this future potential market. This potential market will be created by large organizations that need to meet the deadlines for the benchmark conditions [(i.e. renewable energy targets)] (Bertrand, 2013). These bechmark conditions support the investment in renewable energy, as explained in chapter 5.

6.2.2 Leasing

Leasing is the second build-own-operate rooftop PV model. The executing organization is in charge of the project management. The installation and the purchase of the systems are outsourced. The financial contribution of the organization is their main contribution to the execution of the purchase and installation of large systems. Within this business model the bank is the owner of the installation and the customer pays a monthly fee. The leasing model is oriented towards businesses and smaller investors, often SPVs (Special Purpose Vehicle). An SPV is an organization specially founded to invest, in this case in solar panels. This term is used in the rest of this paragraph for the customer of the bank. The constructions looks similar to the renting model but the actual customer of the bank is not the owner roof but the SPV who pays the monthly leasing fee.

Large banks in Flanders mostly apply the Leasing business model. Belfius is one of the largest banks in Belgium and provides the possibility to lease PV panels. Belfius outsources the purchase, installation and maintenance of the systems. The banks key resources are their financial resources. They consult an external organization for advice concerning the quality of the installation companies and the systems. Belfius is the official owner of the systems. In this construction the SPV pays a monthly leasing fee to Belfius. The SPV and Belfius act together as one organization towards the roof owner. The SPV is responsible for all contact with the roof owner. The SPV pays a monthly rent to the roof owner and the roof owner purchases the produced electricity from the SPV. Both prices vary per application.

The previous paragraph discussed the big picture of the business model of Belfius. To understand their entire business model more detailed information is needed. This is explained in the following section. Right after the installation of the systems Belfius is the owner of the systems and of the RVO. The duration of the leasing contract between Belfius and the SPV in general is ten years. The lease contract between Belfius and the SPV is shorter than the total duration of the RVO (i.e. in most situations the duration of the RVO will be 20 years and the lease contract is 10/15 years). In the lease contract with Belfius, the SPV and Belfius decide for which period the RVO is owned by Belfius. After the expiration of the lease contract the SPV is enabled to lift an option to purchase the entire system for 1% of the total investment of the system. The compensation of this purchase is this low because Belfius does not want to get involved with the removal of the systems from the location at the end of the RVO. When the lease contract has ended and the SPV has met all the payment restrictions, the RVO is owned by the SPV. The bank is then totally out of the picture. In this new situation the SPV continues with the Renting business model.

For Belfius the business model is almost riskless. The application for the GSCs and the subsidies and taxations are performed and cashed by the SPV. And the lease payments to Belfius are guaranteed, as they are directly paid from the income of the purchase of electricity and GSCs. The guaranteed income generated from the purchases exceeds the monthly lease payments and therefore guarantees liquidity. The lease payments are cashed using a special developed season bounded repayments system. Within this system the SPV pays a higher fee to the bank during the summer, since the systems produce more electricity which increases the income of the system, and a lower fee during winter. The contract agreements have an important role in the execution of this business model. During the contract the bank and SPV agree to transfer all income of the system to a closed bank account. This means the money on this account can only be transferred when both parties, both Belfius, agree. This provides a guaranteed and secured investment for Belfius.

The customer segment (SPV) of Belfius is solely firm oriented due to several reasons. One reason was already explained in the paragraph of the residential business model. Leasing contracts for consumers have to deal with very strict regulations. Another reason is the extra profits generated by firms due to reduced VAT on their energy bills; this is impossible for consumers since they cannot generate profits. This beneficial VAT regulation allows companies to partly deduct their energy costs they normally would have made from their profits. These beneficial conditions result in higher final profits of the system. The VAT conditions make the model less applicable to consumers. The business model of Belfius is shown in Figure 30 and Figure 31. In Figure 31 a box is constructed to visualize the activities performed by the collaboration of both the SPV and the bank.

Figure 30 Leasing business model Belfius

Key Partners
Consultant
Installation company
SPV

Key Activities
Financing installation
Advising customer which installation is best (using advise consultant)
Contract building

Key Resources
Financial resources

Value Propositions
Season linked payments
Advises from consultant
Financial resources
Interesting yields

Customer Relationships
Monthly payments SPV
Information sessions with cooperate banker

Channels
Email/ telephone
Presentations

Customer Segments
B2B (SPV)

Cost Structure
Labor hours for management and contract development
Costs for external advise (consultant)
Costs for system purchase and installation

Revenue Streams
Monthly leasing fee

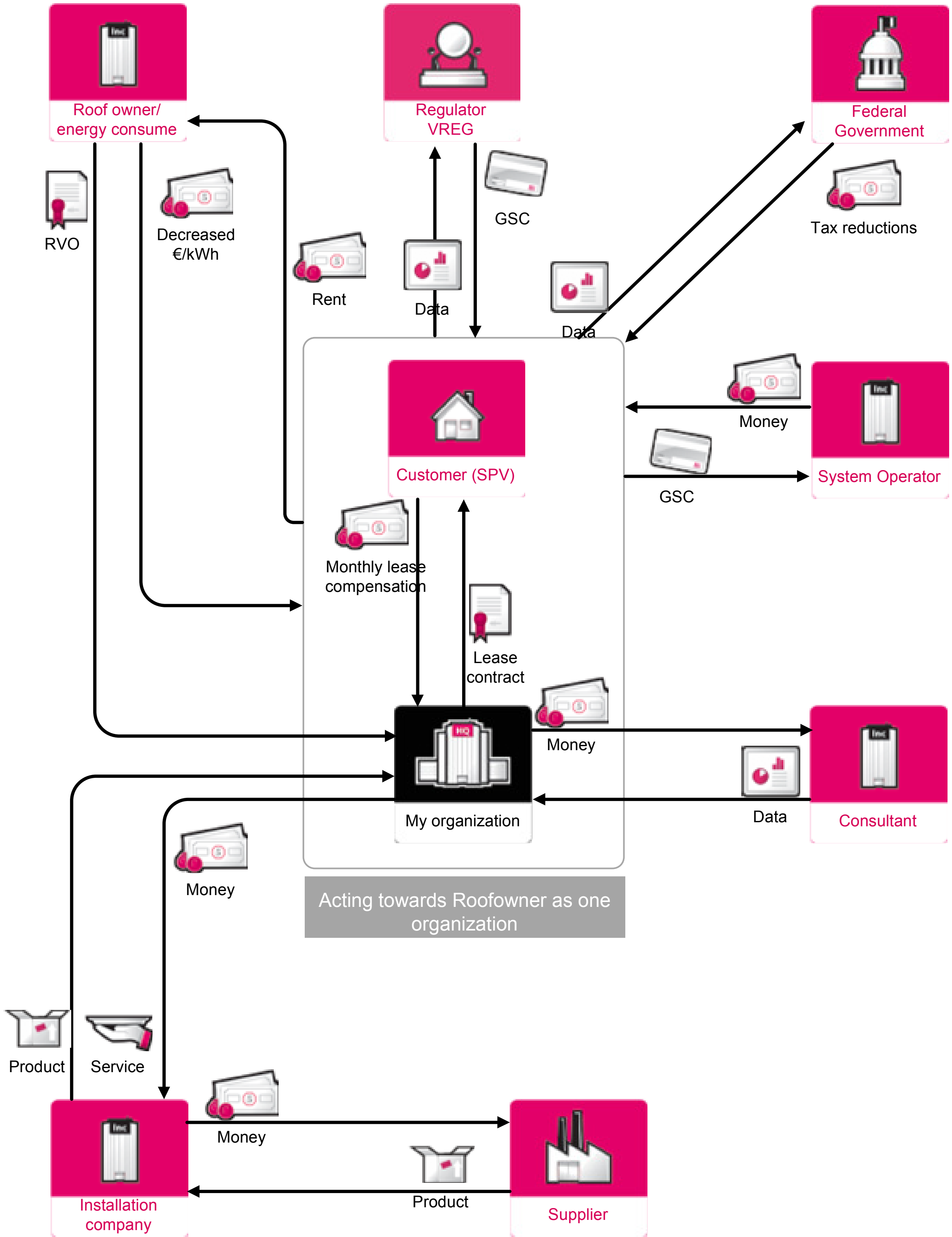


Figure 31 Leasing business model Belfius

Development of business model over time

The main development of Belfius was their focus change. Belfius started the leasing business model in 2008. The model started because of the positive support mechanism system in Flanders, with the GSC as most important motivator. In the beginning Belfius orientated solely to organizations that wanted to invest in large systems (>250 kWP) on the B2B market. The model was most profitable in this market due to the economies of scale. Since July 2012, when the compensation for GSC drastically dropped, they changed their focus to the more smaller systems (<10 kV). They are now mainly orientated towards schools. Because in this market the (grey) electricity prices to compete with are much higher compared to the prices for the larger energy consumers. They provided a similar explanation to this shift as explained for the B2B model. What provides Belfius more opportunities due to the extra financial space. Belfius also adopted the duration of the leasing contracts similar to the developments of GSC in 2013. The duration of the GSCs compensation changed in 2013 from 20 years to 10 years. The compensation of the GSCs was the main pillar for a guaranteed investment for Belfius, as explained in the previous section. Therefore they adapted the general duration of the leasing contract to 10 years, to enable Belfius to maintain their guaranteed investment.

Belfius also adapted their market orientation. Since 2008 their main target market was the Flemish market, this changed in 2012. Due to the drastic reactions in the compensation of the GSCs, the projects in this region became less profitable. In Flanders the market almost stopped under these new circumstances. Therefore Belfius changed their focus to other regions in Belgium. Wallonia and Brussels adapted their supporting mechanisms as well over the last years. The mechanisms in these regions are now more oriented towards the stimulation of larger systems and therefore of interest for a Leasing business model.

In the future Belfius expects new market growth in Flanders, when the electricity price for grey electricity increases. This will provide the lease companies with a broader operating frame to realize the payments of the lease fee. Belfius also considers the foundation, together with energy suppliers, of their own SPV in the future. They are now performing market research to be able to sketch possible opportunities in this area. The first outcomes of this study show a positive vision of an existing demand for this model. This model is still in development.

6.2.3 Cooperative

The cooperative is the third build- own- operate rooftop PV business model. The cooperative model is mostly focused on the financing mechanisms to be able to perform the purchase of the renewable energy production technologies. These cooperatives are not solely oriented towards solar energy but renewable energy in general. Cooperatives gather numerous members who jointly finance the purchase of the installation. The cooperative partly or totally outsources the installation and maintenance of the systems, but stays owner of the system after installation. The target group for the cooperatives are households. The main goal of the cooperatives is to expand renewable energy production, having a more social than financial goal in mind.

Ecopower is the largest cooperative in Flanders. Within the business model of Ecopower various activities need to be distinguished to understand the larger picture. Therefore the general model applied by Ecopower is first described, before clarifying the model applied specifically for the PV systems. Ecopower is an energy producer and supplier for its cooperative members. A cooperative member is a consumer who owns at least one share of the cooperation (i.e. for Ecopower one share has the value of 250 euro, a maximum of 50 shares per cooperator is applied). A maximal yearly dividend of 6% is paid to the cooperative members. Apart from the dividend the cooperative member also has the right/option/possibility to purchase green electricity from the cooperative. Ecopower invests in various renewable energy projects, having the goal to achieve the full ownership of the projects. The produced green energy is sold on the energy market (in Amsterdam), where the GVO's (Guarantee of Origin) are retained (the meaning of a GVO is further discussed in appendix 5.1). Thereafter Ecopower repurchases electricity, fitted to the demand, from this market and sells it to its cooperative members. The electricity sold to the cooperative members is sold at cost price, this electricity is labeled as green energy (since the GVO's have been retained). Ecopower is able to supply energy to its cooperative members since it has a licence to supply electricity in Flanders. Ecopower applied for this licence before the electricity market was liberalized in 2003. (the responsibilities related to this licence are discussed in chapter 5). Ecopower generates revenue from the production of electricity and the sale of GSCs. For the production of solar energy Ecopower uses a somewhat adapted model oriented to the smaller systems. In order to be able to make use of net metering (for systems up to 10 kWP) and better prices to compete with the general model is adapted, this business model is specified in the following section.

The business model applied for PV solely focuses on direct supply of electricity. Most activities performed in this construction are similar to those of the Renting business model. The main difference in this model is the way to finance the initial investment and the fact that there is no fee for the rental of the roof. Systems are installed on the roof of households. The initial investment is made by Ecopower, and is totally financed by the financial resources of Ecopower. These consist of the financial contribution made by the cooperative members when they purchased their shares. Ecopower is in charge of the project management but outsources the installation and purchase of the systems. The electricity producted is consumed completely by the owner of the roof. The roof owner is always a cooperative member. But not vice versa, so not every cooperative member is obliged to have PV systems. This model provides the possibility for households with less financial resources to consume green energy without the initial investment. In special situations Ecopower even offered payments in terms for the purchase of a share. The GSCs and the subsidies and taxations are managed and cashed by Ecopower. The cooperative business model of Ecopower is shown in Figure 32 and Figure 33.

Figure 32 Cooperative business model Ecopower

<table>
<tr>
<td rowspan="2">Key Partners

Installation companies
Cooperative members</td>
<td>Key Activities

Project development
Financial constructions
Information provision</td>
<td rowspan="2">Value Propositions

Dividend of 6%
Low electricity costs and energy supply contract
Information for cooperative members</td>
<td>Customer Relationships

General meeting
Open board meetings
News letter (paper)</td>
<td rowspan="2">Customer Segments

Cooperative members
consumers</td>
</tr>
<tr>
<td>Key Resources

Expertise
Supplier license
Capital for investment</td>
<td>Channels

Website
Facebook
Mouth to mouth</td>
</tr>
<tr>
<td colspan="3">Cost Structure
Labor hours for staff (according to statutes board members are not paid)
Outsourcing of installation
Initial investment PV systems
Cost of operation and maintenance</td>
<td colspan="2">Revenue Streams
Electricity production (€/ kWh)
Revenues from GSC
Sales of shares</td>
</tr>
</table>

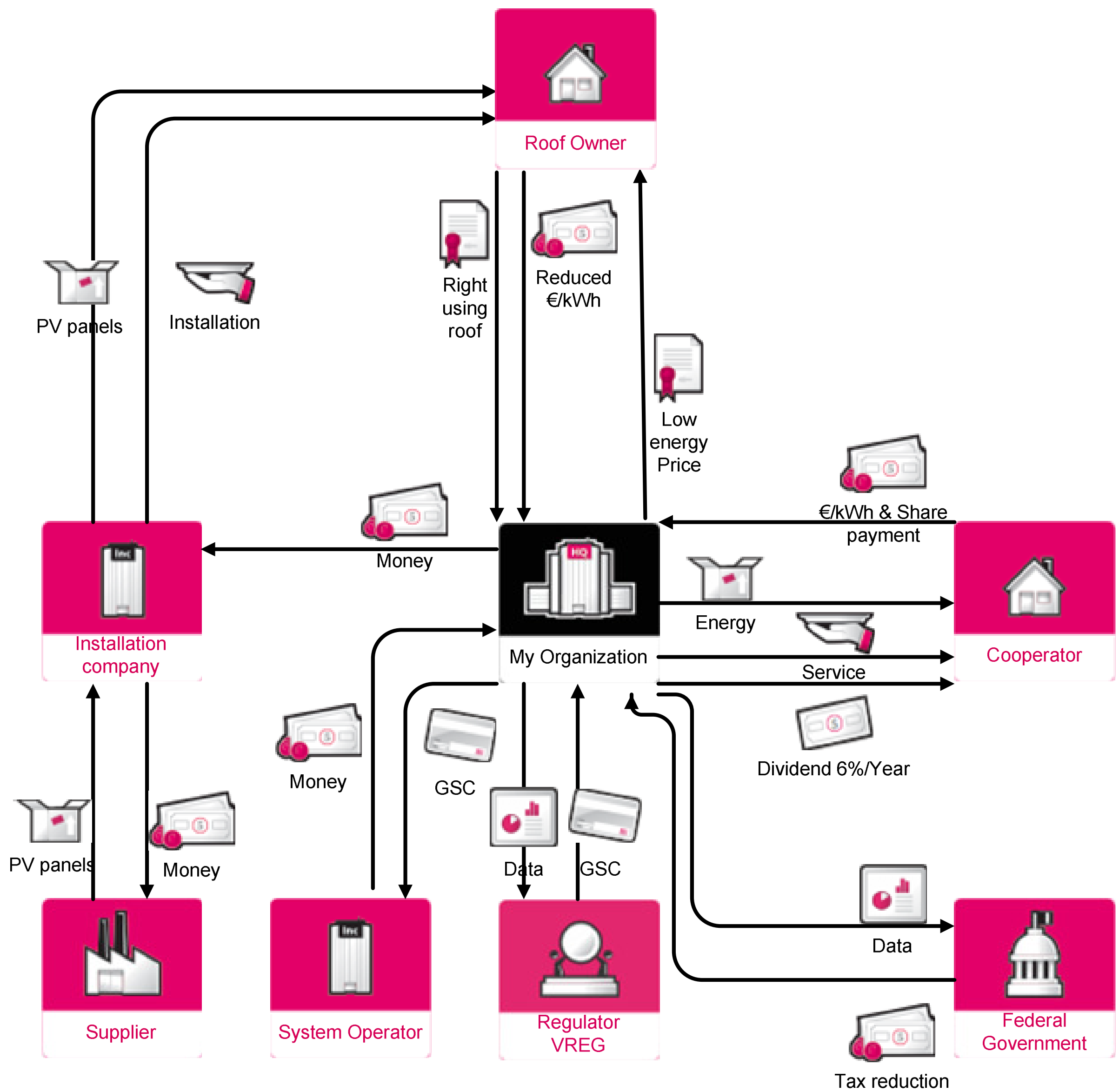


Figure 33 Cooperative business model Ecopower

Development of business model over time

In 2006 Ecopower launched the "PV-privé", PV on private roofs, program. Through this program it succeeded in 2007 to implement about 700 PV systems on the roofs of households who were unable to do the initial investment of a system. In 2006 the ecology premium was still in place and provided an even more beneficial financial environment, apart from the support mechanisms applicable to households. Ecopower was taken to court for the use of this ecology premium for the implementation of PV on the roofs of households. As explained previously the ecology premium is solely applicable for organizations and not for households. But Ecopower won the case, because it is the official owner of the installation and they are an organization. However, Ecopower decided to quit this business model. This was partly caused by the adaptations to the ecology law in 2007, as explained in Chapter 5. Additionally, problems occurred with households selling their houses and associated ownership disputes.

In 2009 Ecopower was able to apply this model again, because of decreased system costs and available supporting mechanisms. However, Ecopower did change its target group and focused with the new projects solely on school buildings. Within these projects the schools were able to purchase the electricity of Ecopower at a generously low price, approximately 0,12 €/kWh. The business model for school projects stopped after the abolishment of the high GSC compensations in July 2012. Due to the implementation of the injection tariff in January 2013 the costs of these projects increased. Since Ecopower didn't anticipated these price developments, the costs of the projects endanger the financial profit. This means that even existing projects face some profitablility problems due to changed policy.

REScoop.eu is an European federation of citizen cooperatives and is initiated in Belgium by one of the founders of Ecopower. In section 6.4.2 the business model of REScoop.eu is further discussed. Besides the model of section 6.4.2 they also apply a similar business model as Ecopower. The executive manager confirmed that similar problems were faced by other REScoop.be members as discussed in the previous section. He also discussed some future developments for PV systems in the cooperative world. The main outcome he provided was a change of focus in the cooperative PV market. This development will lead to an increased implementation of a combined business model to stimulate solar energy in the market. The main idea of this model was the introduction of the combination of increased energy saving solutions with PV installations. This combination will be used in order to overcome the decreased subsidies in the Flemish market.

6.2.3.2 Variants to the Cooperative business model

A number of interesting variants to the general cooperative business model are applied in the Flemish market. In this section the differences in these variants, compared to the general cooperative business model, are explained. These models are not completely discussed since they contain the same general conditions as explained in the previous paragraph.

BeauVent

In the south-western part of Flanders two men wanted to be self-sufficient for their energy supply. In order to realize their desire they founded the cooperation BeauVent. This cooperative became the first outside organization making use of the license of Ecopower to supply energy. BeauVent used this opportunity to supply energy to their own cooperative members. Along with the cooperative BeauVent they also founded the NPO, not for profit organization ZonneWinDT, which is focused on energy saving. This combination makes the business model of BeauVent special as: for every share that is bought, the new cooperative members receive a voucher for a two hours energy-audit. The energy audit analyzes the energy consumption of the consumer, with the aim to detect energy saving potential and stimulate improvements. With this construction the cooperative finances, as part of its social goal, part of the functioning of the NPO and creates a direct link for the cooperative members between renewable energy and energy savings.

Ilanga

Ilanga is another cooperation which applies a similar business model as discussed in paragraph 6.3.2, but they have a remarkable addition to their model. In line with its social goal. In its model Ilanga installs one PV system in a developing country for every 50 systems installed in Flanders.

6.3 Utility-scale power producer

This third generic business model is in many aspects similar to the previous business model type: Build-own-operate rooftop PV. In the Utility-scale power producer business model the organization manages the entire process. The process includes the purchase, the installation and operation and maintenance of the system. The firm is the owner of the facility, although also in this model external investors often participate. The organization is an energy producer, and nearby consumers form the main customer group (Schoettl & Lehmann-Ortega, 2012). The main difference with the previous business model is the ownership of the location to which the system is mounted. Within this business model, the surface and the large systems are owned by the executive organization. These systems are only ground mounted since it is impossible to purchase just a roof. The main competences of the firm remain similar to those of the Build-own-operate rooftop PV. However a larger initial capital is needed to purchase the location. The business model applied in Flanders can be located in the utility scale circle of Figure 21.

Sun Projects applies this Utility-scale power producer model that is, as already explained, in many aspects comparable to the Build-own-operate rooftop PV business model. The systems are purchased and owned by Sun Projects but the actual installation of the systems is outsourced. External investors are needed to finance the systems and the location. The business model applied by Sun Projects differentiates from the previous model because the location the PV systems are mounted to is owned by Sun Projects. Solely ground-mounted systems are used in this model. The actual installation of the system is outsourced and the main competences of Sun Projects are to manage the financial aspects and do the project management. Their main target customers are the nearby energy consumers. Sun Projects sells all the produced electricity. The total revenues are generated from the sales of the electricity per kWh and the sale of the GSCs and other forms of governmental support. The GSCs and the subsidies and taxations are managed and cashed by Sun Projects. This business model applied by Sun Projects is shown in Figure 34 and Figure 35.

Figure 34 Utility scale Sun Projects

<table>
<tr>
<td rowspan="2">Key Partners

Installation companies
Production companies</td>
<td>Key Activities

Purchasing systems
Installation management
Project management
Financial constructions</td>
<td rowspan="2">Value Propositions

Green energy</td>
<td>Customer Relationships

Energy supply</td>
<td rowspan="2">Customer Segments

B2B
Consumers</td>
</tr>
<tr>
<td>Key Resources

Efficient resource channels
Network
Capital for investment</td>
<td>Channels

Direct contact
Website/ telephone</td>
</tr>
<tr>
<td colspan="3">Cost Structure
Labor hours for management
Outsourcing of installation
Initial investment installation and location</td>
<td colspan="2">Revenue Streams
Electricity sales (€/ kWh)
GSC sales</td>
</tr>
</table>

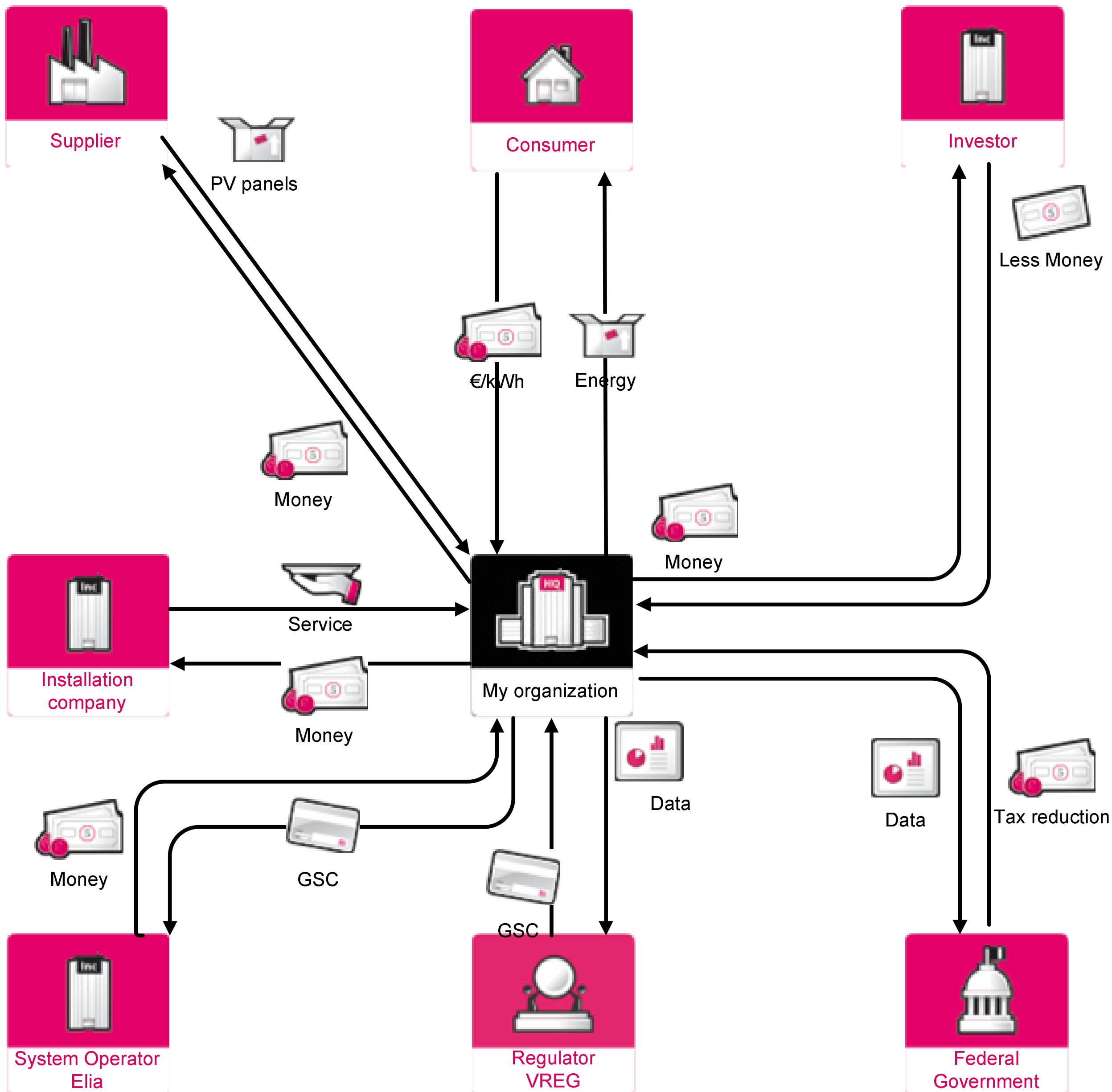


Figure 35 Utility scale Sun Projects

Development of business model over time

In 2006 Sun Projects started with the implementation of the Utility-scale business model. The implementation of the GSC was the direct motivation to start with this business model. In 2008 Sun Projects stopped building systems on locations that were owned by the company. The reason for the diminished use of the Utility-scale model was mainly caused by their financial agreements with the bank and other investors. After 2008 they ran out of financial resources for these projects and continued their activities using the Renting business model. The CEO discussed that the Utility-scale business model could have been profitable till the end of 2012, but they chose for the Renting model to decrease the initial investments (i.e. there is no need to buy a location anymore).

6.4 Value- added service provider

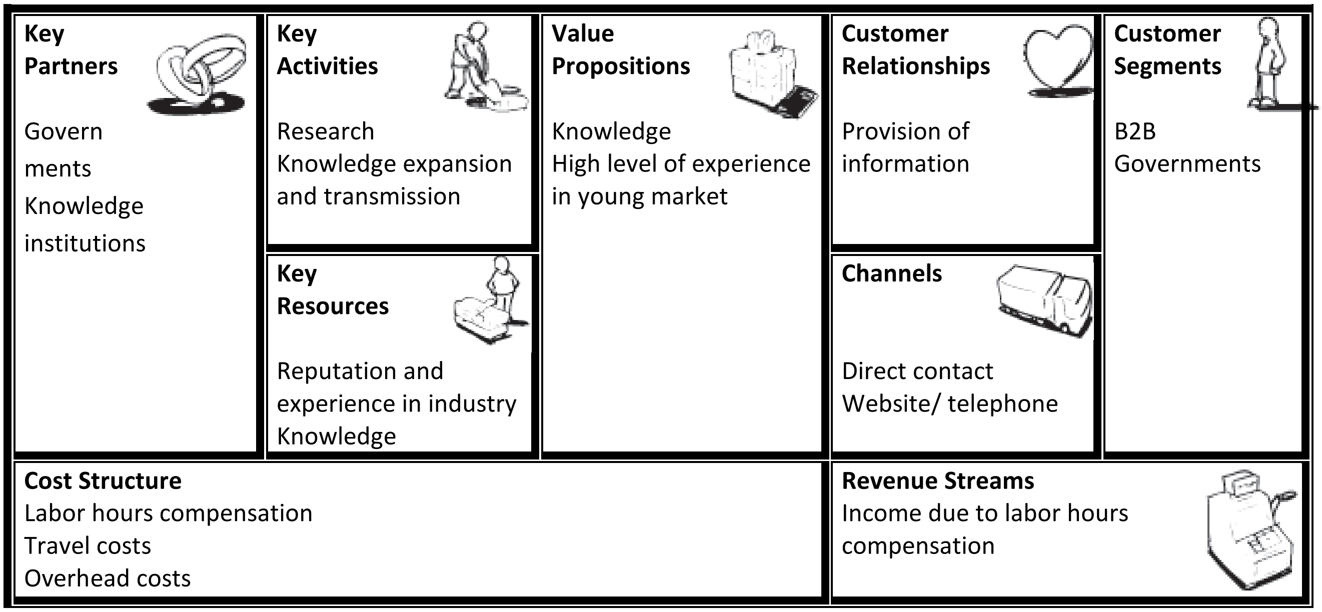
The organization that applies the Value added service model offers services other than the pure installation or sale of PV installations. The additional services provided are mainly consulting for extra help after installation or information provision concerning the realization of more complicated or newly executed PV projects. The experience of the organization in this market is of decisive value. The organization is specialized in one of the steps in the value chain and does not own the system. The targeted customer segment varies per specific business model in this market. In the following section the value added service business models observed in the Flemish market are discussed. The business models fit within the value-added service provider circle of Figure 21.

6.4.1 Consulting services

The first value added business model is the consulting model. Within this model the customer receives a value added service in the form of the provision of information. This information is in most cases project specific knowledge and helps the customer developing their implementation or development strategy. The customers are owners or potential owners of PV systems. The firms in this market gain their competitive advantage due to increased experience and the image of the consulting company.

Zero Emissions Solutions (ZES) is one of the leading consultancy companies in Flanders concerning solar energy. The CEO of ZES is working in this branch for many years and is considered to be one of the pioneers in the industry. ZES applies their consulting business model where knowledge in the form of advice is sold to the customers. They receive a labor hour compensation for the work they perform. ZES mainly focuses on information provision concerning larger projects, and perform research in this area to expand their knowledge. Their target market is oriented towards businesses and governments. The business model of ZES is shown in Figure 36 and Figure 36 and Figure 37.

Figure 36 Consulting services ZES



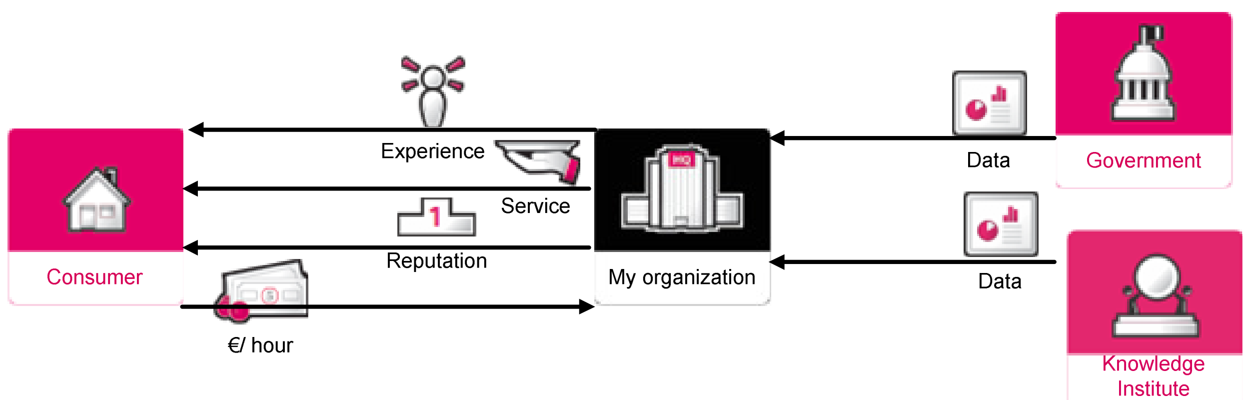


Figure 37 Consulting services ZES

Development of business model over time

The consulting business model itself did not change much over time. ZES was founded in 2009 and is one of the leading consultants for solar energy in Flanders ever since. They performed numerous studies to increase their knowledge to be able to provide customers with underpinned advise on various solar projects. In the beginning of the foundation ZES was consulted mainly for their skills, experience and independent advice in the solar energy market. Due to the developments of the support mechanisms in Flanders an ZES shifted more towards the development and research of different business models applicable in the Flemish market. The CEO of ZES explains the focus of the projects, before the changes in supporting conditions, to be more project-oriented. Due to over- subsidizing, which was in place in the beginning of the foundation of the company, positive financial conditions were created in this market. Over-subsidizing is governmental stimulation with the use of a subsidy, wherein the subsidy is so high that it compensates more than the subsidy is meant for. The financial conditions were so good that they were negatively influencing creative solutions to the commercialization of solar panels. After the decreasing supporting conditions in Flanders (i.e. since 2012) CES was more contacted to consult the problems faced due to these changes. The shift in orientation of their consulting activities was the main change to their business model.

6.4.2 Market stimulation

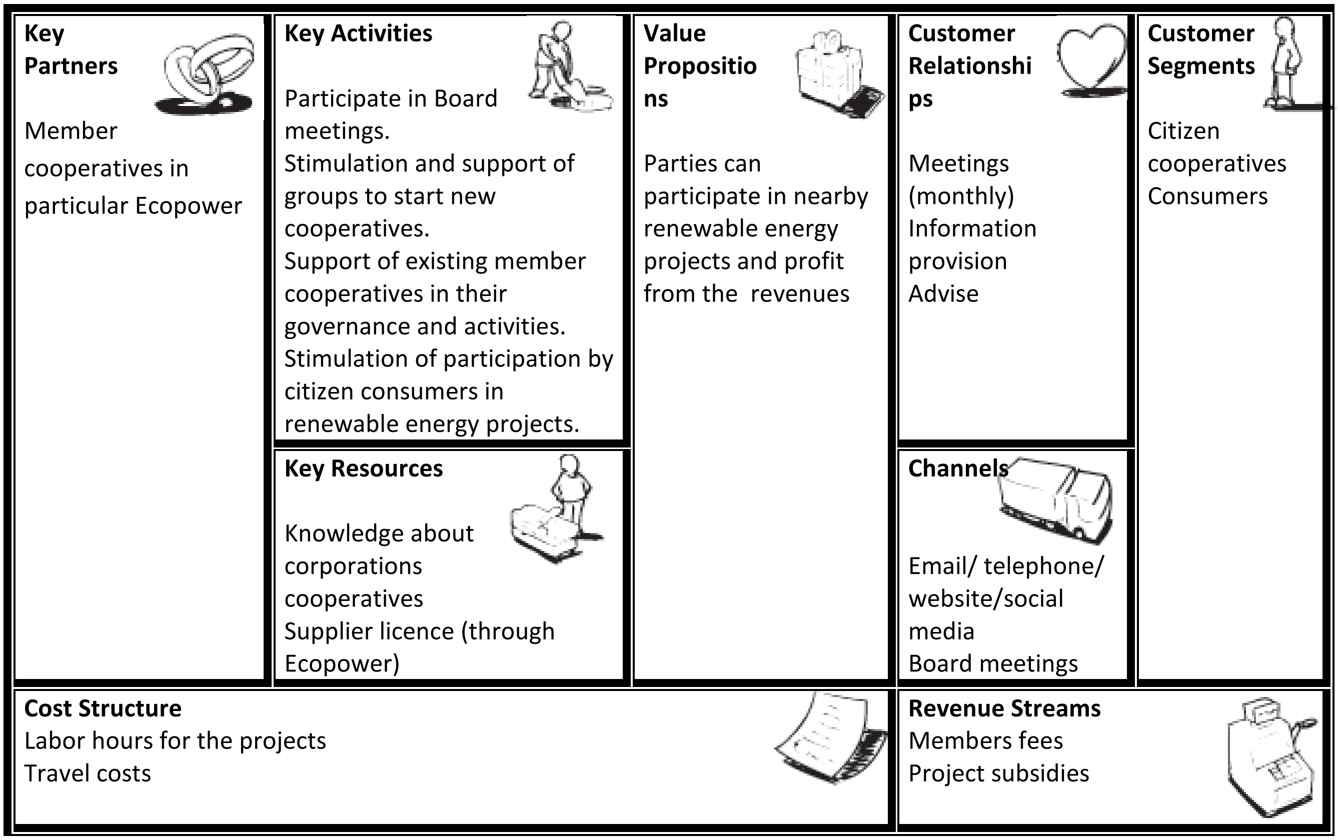
The second value added service model active in Flanders is the market stimulation business model. The model is also mainly oriented on the facilitation of information. The information is oriented towards potential customers, who live nearby a renewable energy system, or who want to cooperatively bundle financial resources to be able to purchase a PV systems. The model is oriented to renewable energy in general not solely PV. The market stimulation business model distinguishes from the cooperative model since this organization solely provides information and advice for newly developed cooperatives and new participation opportunities for new cooperative membrers. This model distinguishes from the consulting model since they are clearly focused on one main goal; the stimulation of the implementation of renewable energy (not the goal to sell advise as in the consultancy model). This lobbying role distinguishes them from the other business models in the market.

Within the solar energy market there are numerous cooperatives founded to collect financial resources to purchase larger systems on the roofs of public buildings. REScoop.be is not a cooperative itself, it is an umbrella organization of citizen cooperatives which stimulates consumers to participate in these renewable energy projects enabling them to benefit from the positive financial cash flow the renewable energy systems generate. REScoop.be also motivates and supports groups of citizen to create new cooperatives. This support resulted in the foundation of numerous cooperatives and participation by citizens. Rescoop.be also brings the different cooperatives together for discussion and to provide them with additional information, explaining the foundation of a new cooperative. These cooperatives are not competitive among each other, as Vansintjan (2013) stated;

"We act similar to a strawberry plant, we continuously want to help founding new cooperatives using our own resources. A strawberry plant also propagates by using its offshoots as a start for the new plant"

This makes the cooperatives special organizations among the other organizations in the Flemish market. Their main goal is not to earn money but to expand the production of renewable energy in total. The member cooperative organizations are charged with a yearly fee to cover the cost of the activities REScoop.be performs. This business model of REScoop.be is shown in Figure 38 and Figure 39.

Figure 38 Market Stimulation REScoop.be



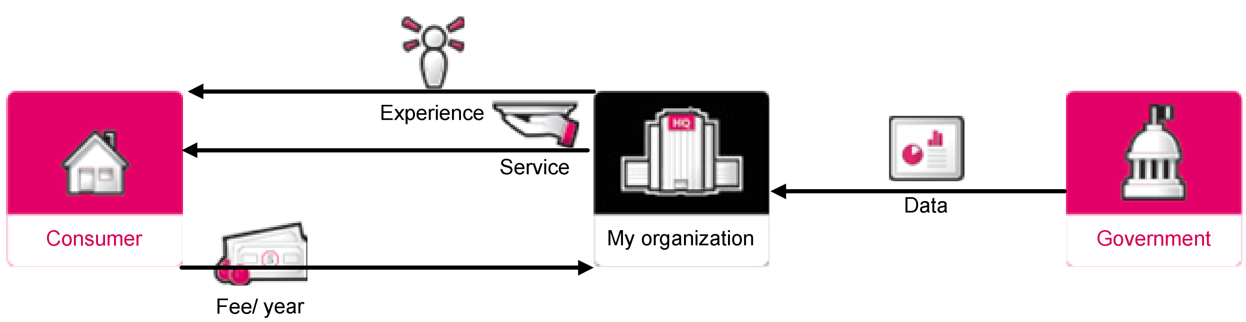


Figure 39 Market Stimulation REScoop.be

Development of business model over time

REScoop.be was founded in 2010 in Flanders and therefore the developments over time are difficult to trace. The business model as described above was applied at the time of the foundation.

Some modifications have had to be made as the government support schemes have been changed since then. As explained in the development section of the cooperative business model, REScoop.be is continuously looking for new approaches to stimulate the implementation of solar energy with the current support system. REScoop.be is also trying to find new solutions for the implementation, such as the combination of solar energy with energy savings.

6.4.3 Service and Monitoring

Numerous firms in the Flemish energy market apply the Service and Monitoring business model. In this model the firm solely provides a maintenance role for the owner of a PV system. The customer owns the PV system, and operation and maintenance service is provided by the organization. In most scenarios this model was provided as an additional service to the installation of larger projects. The service can also be provided separate from the installation and purchase of the systems. During the operation and maintenance (O&M) the efficiency of the systems is the main point of interest, because every missed kWh during the project will negatively influence the financial feasibility of the project.

Solar Access is one of the organizations that offer Service and monitoring. The organization observes the activities of the PV installation, using specialized computer programs to scan the energy production of the facilities. With the help of these programs errors can be detected and therefore the efficiency of the systems can be evaluated and improved. After the observation of a failure of the installation, the organization will come in action to restore the errors. It depends on the contract agreements between the organization and the consumer to which degree the restoration of failures is financially covert by Solar Access. The contract binds Solar Access to the consumer for the duration of the agreement. Solar Access receives a monthly compensation from the customer for the O&M. The model is solely oriented to B2B. The business model of Solar Access is shown in Figure 40 and Figure 41.

Figure 40 Service and monitoring Solar Access

Key Partners	**Key Activities**	**Value Propositions**	**Customer Relationships**	**Customer Segments**
IT consultant Supplier of materials	Management of maintenance activities Optimization of monitoring	Optimized service and monitoring	Maintenance checks	B2B Consumers
	Key Resources		**Channels**	
	IT program Network		Email/ telephone	
Cost Structure			**Revenue Streams**	
Labor hours for management and maintenance Costs for reparation materials and computer programs			Yearly fee	

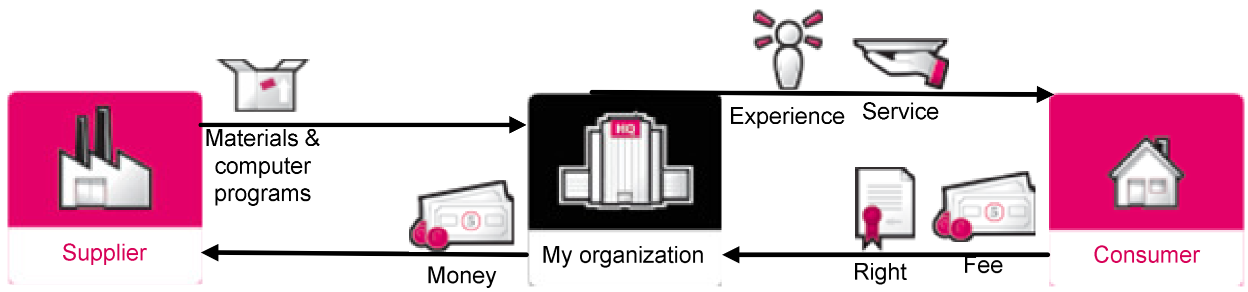


Figure 41 Service and monitoring Solar Access

Development of business model over time

Within the service and monitoring business model there were no changes notable. The possibility of the service and monitoring of a PV system started in 2006. Nowadays the model is still at place although it is less active in the Flemish market due to the decrease in newly build large installations.

6.5 Construction and installation service provider

Within the construction and installation service provider business model the organization offers services with less value additions than in the Value-added model. The organization in this model is specialized in one part of the supply chain and needs other organizations to be able to provide the total installation of a PV system. Thus, main activities in this model are the construction and installation of various parts of the system (Schoettl & Lehmann-Ortega, 2012). This business model is more a traditional business model and there are no examples of variants of this model observed in Flanders. The companies provide a service and are rewarded for the amount of services they provide. The organizations often work for the larger project developers. Due to the generality of these models there was no need to map them. Since this research is oriented on the more innovative business models these business model were not further examined. Two business models were found to be active in the market. The business models found fit in the construction and installation service provider circle of Figure 21.

6.5.1 Electricians

These are companies that are specialized in the electric installation of the PV systems. They connect the systems to the meters of the house or the firm. Their main target customers are the large organizations that outsource this activity. The Electricians receive a financial compensation for the number of installed systems. This business model did not change over time.

6.5.2 Physical installation

The companies active in this market are specialized in the physical installation of the panels. As in the previous Electricians model, the project developers hire the installation companies. They receive financial compensation for the number of panels they have installed. The only change over time in this model is the rise of companies that are actually specialized in solely the physical installation. At first this part of the installation was also performed by the electricians or the project developers. In practice these companies are mostly originated in Germany and deliver their services even trans boundary (Bertrand, 2013).

6.6 Virtual power plant

In the virtual power plant business model the organization is a virtual operator in charge of the management of the distribution network. The organization is the owner of the network and needs to anticipate to fluctuations in consumption and production of electricity. The organization is specialized in energy control and virtually operates the distributed energy by flattening the distribution peaks. The core competences of the organization are the management of the information and trading skills to generate the largest profits from the time dependent distribution prices. The virtual power plant operator is an important organization in the energy market since the party has all information of the energy supplier, producers and consumers. This information is highly valuable for all the stakeholders in the energy market.

The business model of the virtual power plant operator is not yet possible in Flanders, therefore there is no example of the business model discussed in this section. This business model is not possible to apply in Flanders because both distribution and the transition networks rights are owned by governmental assigned organizations. The assigned organizations are restricted by numerous regulations and have therefore limited possibilities to apply the model as explained above. This makes it impossible for other organizations to enter the market and therefore there is no potential competition. This business model is mentioned because there might evolve some possibilities in the future.

Development of business model over time

The assignation contracts for the organizations that manage the networks will end within two years from January 2013 (Vansintjan, 2013). The conditions of the contracts etc are explained in chapter 4 and 5. Taking this knowledge into account some possibilities will turn up in the future for this virtual power plant business model. Within the cooperative world examples from Germany are discussed, these could become interesting and useful for future possible adaptations to the Flemish electricity network. The German example explains a case where the distribution network is divided in small pieces, and partially sold, or adopted, to local cooperative organizations or companies. In this scenario smaller local parties own the future grid and consumers are not forced to pay the enormous amounts for distribution, as is reality nowadays. But these future possible developments are speculative. Overall the virtual power plant is expected to become of more importance because of the upcoming solar industry, as this is an intermittent technology. Different examples already exist in Flanders, which show the increasing importance of the virtual operator. In these examples the grid locally collapsed, as a result of fluctuating electricity implementation into the grid. The fluctuations are caused by electricity produced by PV panels. Improved adaptations to and management of the grind are needed to prevent more problems in the future. Therefore developments in this area are expected.

6.7 Other business models

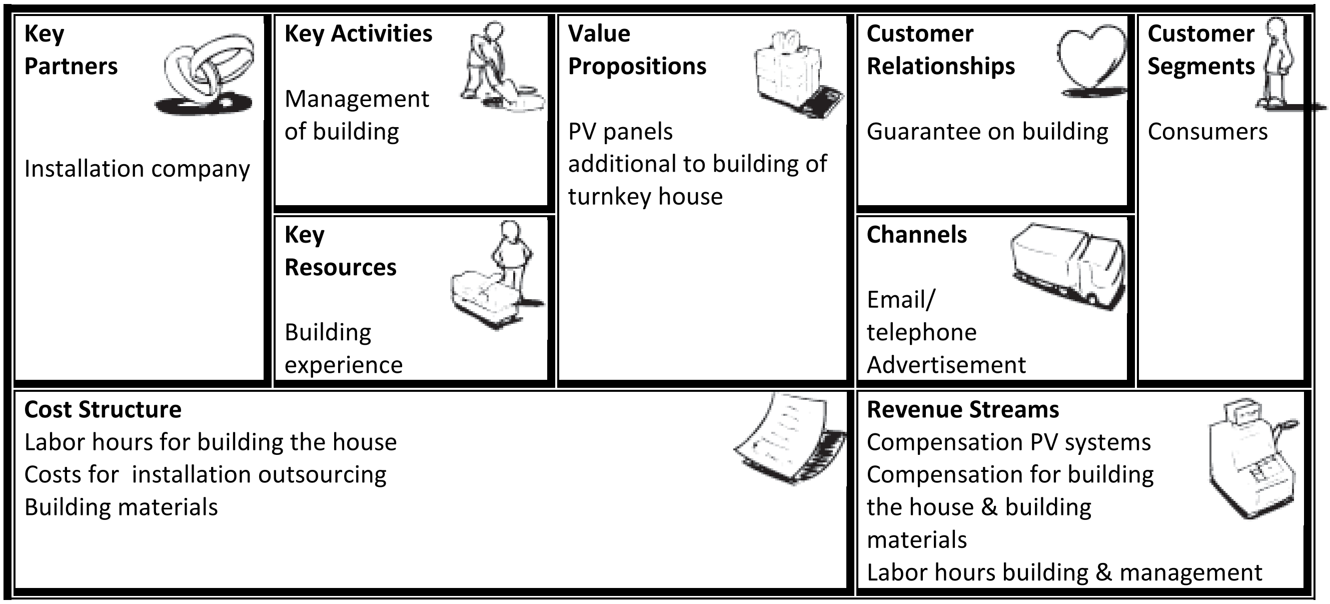
The business models discussed below cannot be categorized in the six generic models of the Schoettl & Lehmann-Ortega (2010). This can be explained by the specification that is made in the article of Schoettl & Lehmann-Ortega (2010). They only specified possible business models applicable for utilities in the energy market. The business models explained in this paragraph consist of the models that require some additional resources; are active in another market as well; or combine the delivery of PV systems with another product. For these business models a new circle will be added to Figure 21 to complete the overview of the business models active on the Flemish market.

6.7.1 PV systems additional to other products

This business model offers PV panels additional to their main product. The activities the organization performs are mainly focused on their core product. Besides this core product they offer a fully installed PV system for the customer. Since the organization is not specialized in solar energy they outsource most steps of the value chain. Their target group is the households that own a roof and are interested in the purchase of their product in combination with solar panels.

Bostoen is one of the organizations in Flanders that offers solar panels additionally to the purchase of their product. The main product of Bostoen is the delivery of a turnkey house for consumers. Bostoen provides the opportunity for the customer to directly implement PV panels in the roof of their newly build turnkey house. Bostoen outsources most steps of the value chain. The GSCs and the subsidies and taxations are managed by Bostoen and cashed by the consumer. The business model of Bostoen is shown in Figure 42 and Figure 43.

Figure 42 Additional model Bostoen



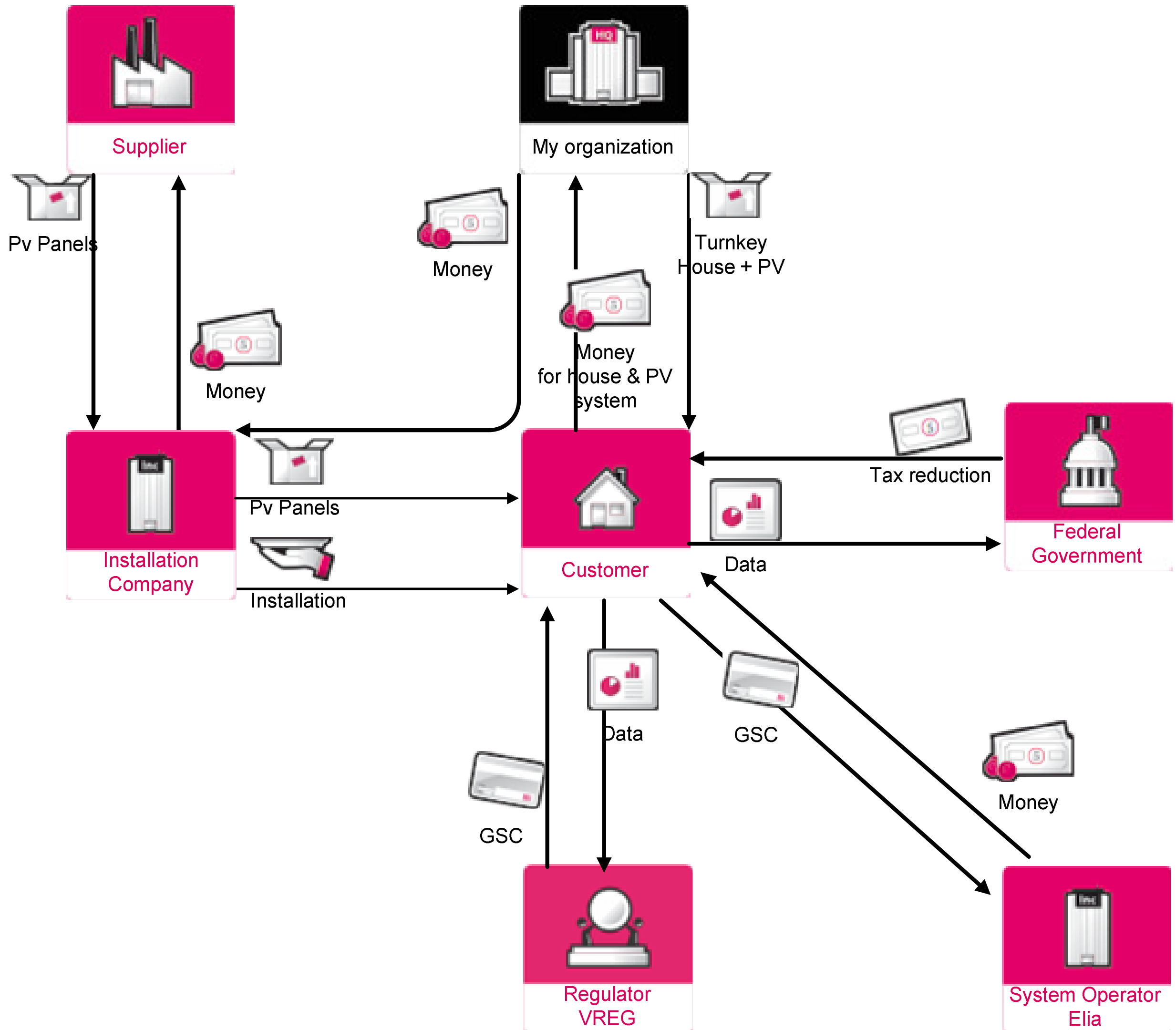


Figure 43 Additional model Bostoen

Development of business model over time

Since this organization was not able to cooperate with an interview the developments of this model are difficult to discuss. But there was one development observed in the business model of Bostoen in the period between August 18th, 2012 and September 31th, 2012. In this period Bostoen offered 8 totally free PV panels and installation on top of the delivered house. This was offered as a discount to the purchase of a turnkey house so without any extra costs. This model was only applied for one and a half month.

For the developments in this market another organization called Sibomat was contacted to gather information about the developments. Sibomat did respond via email that gave some insights in this market. Sibomat is an organization that also provides turnkey houses with the additional option to purchase solar panels. They observed no direct activities in this market within their own organization. They did notice that 3customers were contacting PV installation companies five years after the completion of the buildings themselves. This pattern is explained by the tax deductions, which are only possible for buildings older than 5 years. Sibomat state this pattern to be observed because this strategy will gain them more VAT profits and other budgetary reasons. The other budgetary reasons are the simple fact that most consumers do not have the money to purchase an PV installation at once with the purchase of a turnkey house. This is an example of supporting mechanisms negatively influencing the implementation of solar panels. They did observed more activities in this area for the last two or three years. The observation is probably thanks to the positive financial circumstances till July 2012, the PV panels were efficient in Flanders even without the VAT deduction. In the future this market is expected to expand because of the new law that goes in effect in 2014, which obligates newly build houses to produce renewable energy.

6.7.2 Sales of PV panels

The sale of PV panels is executed using a traditional business model. In this model the customer purchases the product from the supplier. There is no extra service provided whatsoever, and two target customers can be distinguished. The first group is consumers who want to install the PV systems themselves. And the second group is installation companies who do not want to import the panels themselves. In practice these are often the small-scale installation companies. An example of an organization that provides total installation packages of solar panels and mounting systems is Solar Access. The business model of Solar Access is shown in Figure 44 and Figure 45.

Figure 44 Sales PV panels Solar Access

<table>
<tr>
<td rowspan="2">Key Partners

PV panels suppliers</td>
<td>Key Activities

Cheap purchase of PV panels (with good quality)
Sales of panels</td>
<td rowspan="2">Value Propositions

Low costs for quality solar panels</td>
<td>Customer Relationships

Information provision
Providing quotes</td>
<td rowspan="2">Customer Segments

Consumers
B2B</td>
</tr>
<tr>
<td>Key Resources
Efficient distribution channels</td>
<td>Channels

Website
Traditional marketing</td>
</tr>
<tr>
<td colspan="3">Cost Structure
Labor hours
Purchase of PV panels</td>
<td colspan="2">Revenue Streams
Income due to purchase PV panels</td>
</tr>
</table>

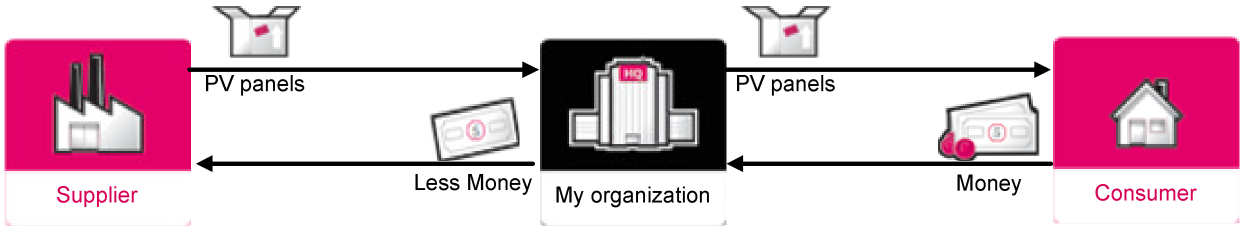


Figure 45 Sales PV panels Solar Acces

Development of business model over time

The traditional business model that is applied for sales of solar panels is not changed over time. However, other than the business model itself there were a lot of developments in this area since 2006. This was initially not part of the research project but because of its large influence on the market worth mentioning. Most important are the enormous cost reductions of the PV panels over time. The average cost price of solar energy produced by a PV panel dropped from $4 per WP in 2008 till $1 per WP in January 2012 (Aanesen et al., 2012). This enormous decrease in costs was caused by the supporting policies applied in China and the increased demands from European countries. In China the supporting mechanism is focused on the production of material for solar energy (i.e. not the production of green energy). This resulted in over production of panels and therefore low prices (Bertrand, 2013). In Flanders this meant the bankruptcy of their last production company because they could not keep up with the Chinese market. All these developments resulted in an overall import of panels in Flanders, mostly from China. The decreases in costs of PV panels is now the motivator for market increase since due to these prices business cases can be made in the future without the use of financial supporting mechanisms (Sun Projects, 2012).

In the previous section all business models in the Flemish market are mapped and described, the findings from this data will be further discussed in the following section. The different business models, and the corresponding companies in the Flemish market, are visualized using the figure of Schoettl & Lehmann-Ortega (2010). This visualization is performed several times to provide the overview of the overall marker at different moments in time. The visualization provides an insight in the different business models applied by single organizations.

6.8 Visualization of the business model in Flanders

In this paragraph an adapted version of the figure of Schoettl & Lehmann-Ortega (2010) is composed to visualize all business models in the Flemish market. Three new figures are composed to show the developments of the business models over time. For the visualization of the entire Flemish market an additive circle is needed to complete the figure of Schoettl & Lehmann-Ortega (2010). Besides the extra circle some other adaptations are made to the figure of Schoettl & Lehmann-Ortega (2010). Extensions and replacements of the circles were necessary to locate the business models correctly in the figure.

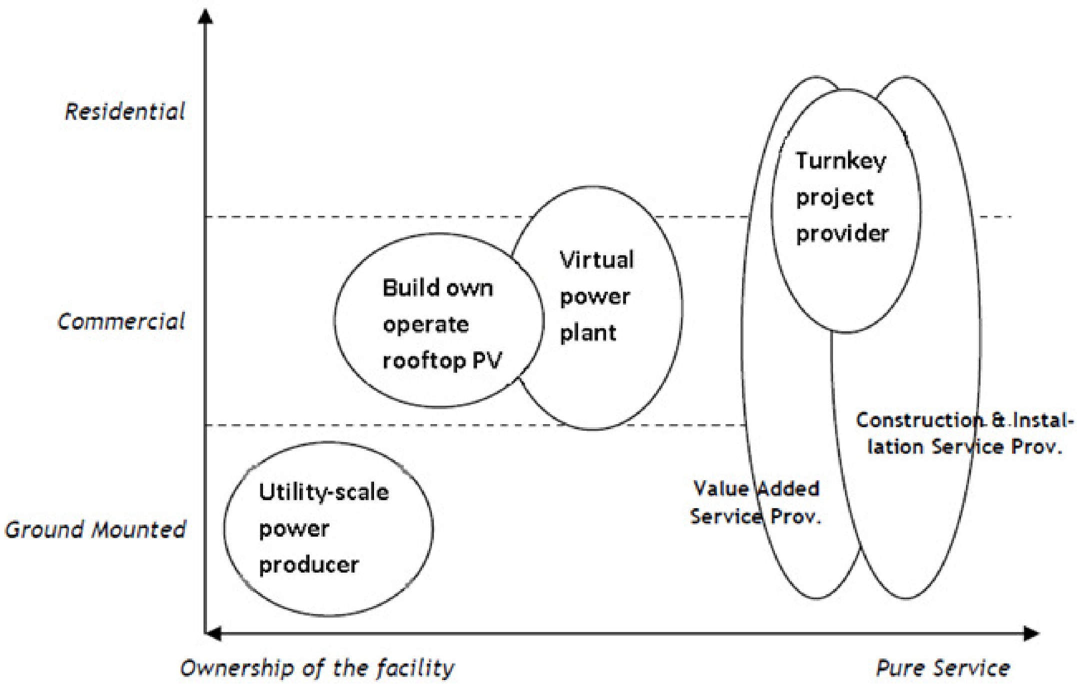
In the article of Schoettl & Lehmann-Ortega (2010) the meaning of the axis and sizes of the circles were not explained into great detail. In the baseline model some circles are partly positioned within two segments. For example the virtual power plant is partly positioned in the residential part of the model. It was impossible to derive the origin of the position of the different circles in the baseline figure. The following interpretation of the figure is to be applied to the newly developed figures.

In the newly developed figures the position of the circles on the Y-axis represent the size of the system (i.e. for the difference between residential, commercial or ground mounted). Large systems are positioned in the lower area and smaller systems in the upper area of the figure. This distinction is mainly applicable to the commercial area, for example the systems located on schools. These circles are located in the commercial upper area of the figure, because they are “small” commercial systems.

For the x-axis the distinction is more obvious. However a circle located in the middle of the x-axis implicates the ownership of the facility to be from both the customer as the organization. For example the Build own operate model that is located more to the center of the x-axis, this can explained as follows. The facility is owned by the organization but the customer owns the location to which the model is mounted. Therefore the circle is located more to the middle on the x-axis. The circles located on the right side of the figure are all totally owned by the customer. But due to limited space in the figure they vary a bit in location.

The size of the circles represents the activities of the particular business model in the market at a certain moment in time. The surface of the visualized circles does not correspond to exact numbers, they reflect to the difference of activity for the business model in the corresponding market. When observing the different figures of the Flemish market over time, the developments of activity can be derived. At first the original figure of Schoettl & Lehmann-Ortega (2010) is shown to be able to compare the new figures to the baseline figure.

Figure 46 Six generic business models (Schoettl & Lehmann-Ortega, 2010)



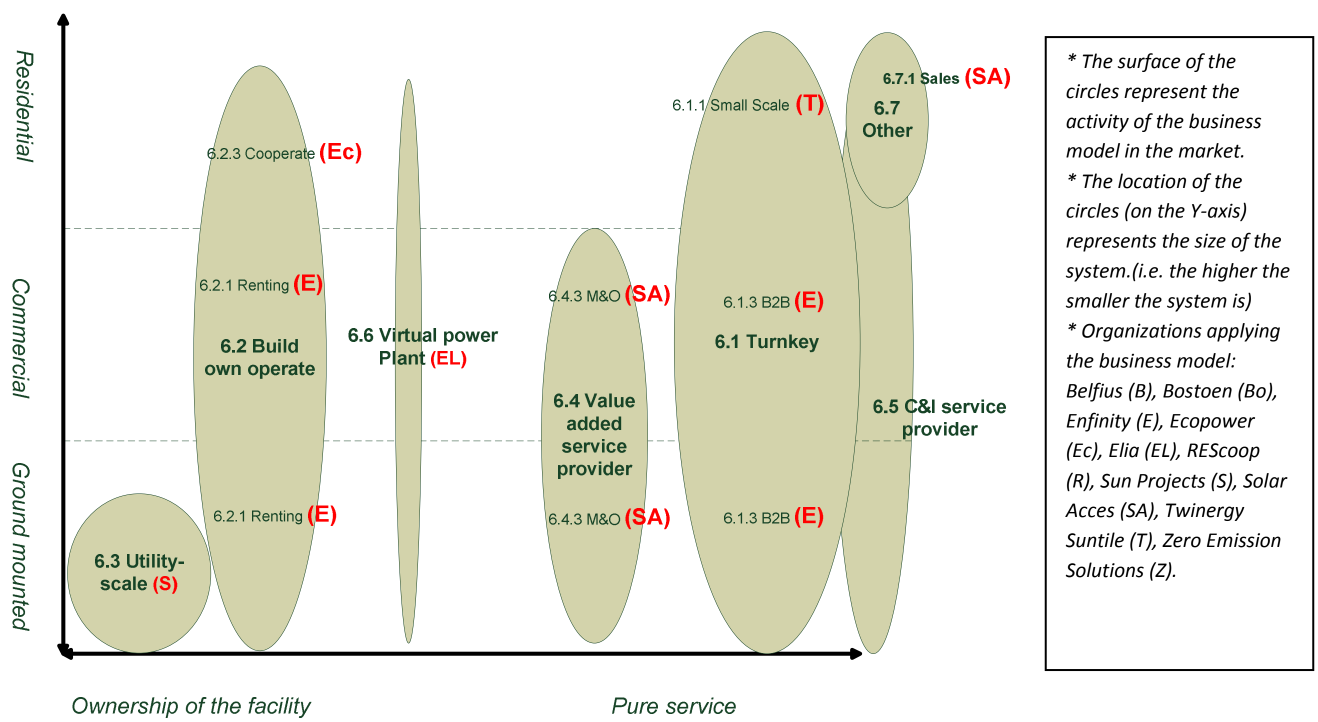


Figure 47 The generic business models in Flanders (in 2006/2007)

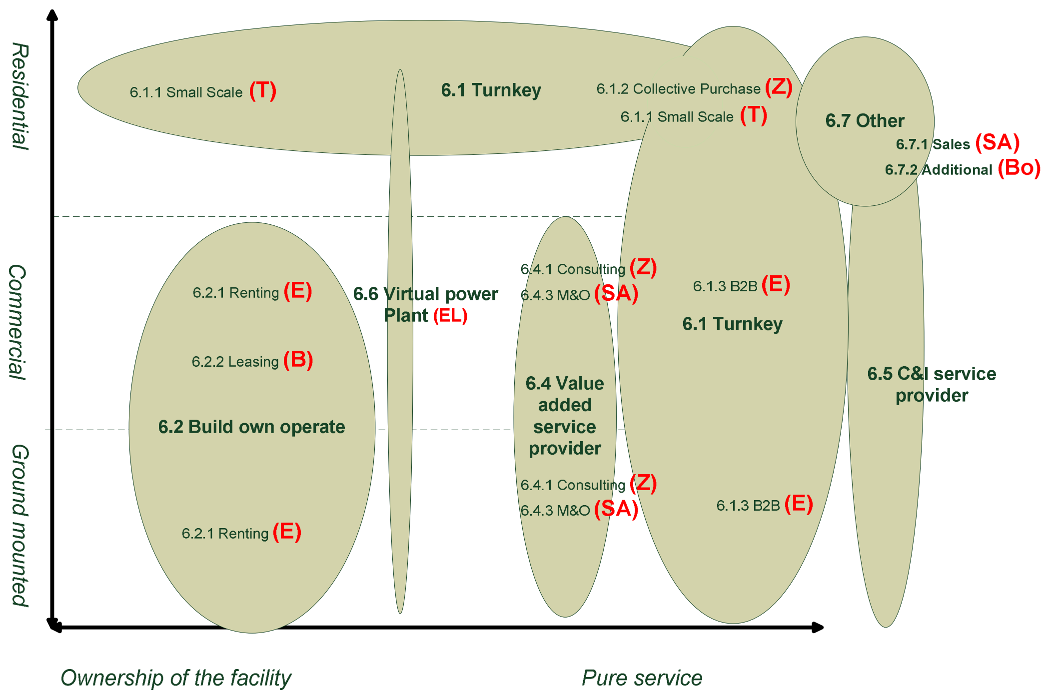


Figure 48 The generic business models in Flanders (in 2010)

** The surface of the circles represent the activity of the business model in the market.*
** The location of the circles (on the Y-axis) represents the size of the system.(i.e. the higher the smaller the system is)*
** Organizations applying the business model: Belfius (B), Bostoen (Bo), Enfinity (E), Ecopower (Ec), Elia (EL), REScoop (R), Sun Projects (S), Solar Acces (SA), Twinergy Suntile (T), Zero Emission Solutions (Z).*

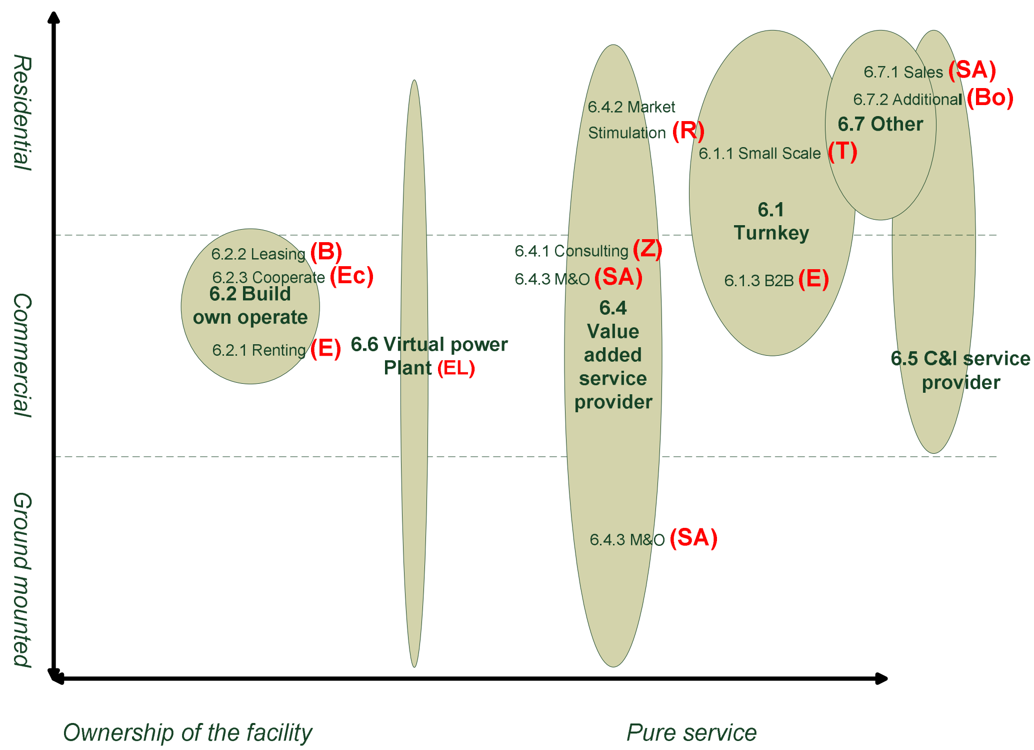


Figure 49 The generic business models in Flanders (in September 2012)

From these figures and the previously found information various conclusions can be drawn. The main patterns within the findings will be discussed in the following section.

6.9 Business model patterns

When observing the previous figures various patterns can be observed. The main observation is the large differences of position and size of the various business models over time. In the last figure the situation is shown of the Flemish market in September 2012. It obviously shows the shrunken market in comparison to the major flourish in 2010. In the following section these different findings will be discussed into more detail.

6.9.1 Several business models within a single organization

One of the findings after mapping the business models was the observation of single organizations applying various business models at the same time. This is clearly visualized in the newly developed figures in the previous section. After observing the various firms that apply several business models into more detail, the following finding came to light. The size of the organizations has impact on the usage of combined business models. Larger organizations applied combined business models more often. This can be explained since larger organizations need larger potential markets to be able to generate enough sales the make profits. A manner to expand your potential group is to approach new potential markets (Pinkse & Van den Buuse, 2012). And the larger organizations have more resources to serve new markets. The smaller firms are only able to adapt small change due to limited resources.

In Flanders the different players tried to expand their potential target group by implementing new business models. With the help of the new business models they enabled other customer groups to participate in solar energy. The renewed business model was mostly used to offer the possibility for the customer to consume solar electricity without the initial investment. The organizations expanded their business models using the gained knowledge of the first business model. There were no examples observed in of organizations entering an entire new market without the use of the gained knowledge of the previous model. The main addition to the value proposition in the new models is the constructions to finance the initial investments. Besides the additional financial construction the business models retained the same value proposition as in the first model.

This pattern can be further explained with the help of the most applied business model combination in the Flanders. Most organizations applied the B2B model directly after their foundation. In a later stage they additionally offered the Renting model. For example Solar Access introduced the Renting model two years after the B2B model. They implemented this second model to be able to convince roof owners of the efficiency of the systems. By offering them both the Renting and the B2B option the owner was able to implement green energy with or without the consequence of a large initial investment. Due to the implementation of the Renting model they expanded the potential customer group with firms that were not able to deal with the initial investment.

6.9.2 Market activities and change of focus

Other information that can be abstracted from the figures is the activity of a business models in the market. The surface of the circles corresponds to the activities of business model in the market at a certain moment in time. From these changes over time different conclusions can be drawn concerning the market activities and the corresponding orientation of the firms in market.

Two main variations of the developed figures can be observed in comparison to the original figure. Firstly the use of various business models in one circle. As explained in the literature the six generic business models are also composed out of the 14 differentiated models. But in between the 14 models only small variations were noticed, such as: the quantity of outsourced steps or customer group. A number of business models observed in the Flemish market varied on more aspects. The second observation was the seventh circle in the new figures. The new circle is a business model observed in the Flemish market and is an addition to the figure of Schoettl & Lehmann-Ortega (2010). They did not observe this model in their research and is therefore a contribution to their figure.

In Figure 47, numerous business models can be observed. Compared to the initial model of Schoettl and Lehman-Ortega (2010) the circles were stretched. The business models in Flanders are therefore oriented towards a broader market with a larger market potential than in the original figure. The sizes of the surfaces of most business models are average compared to the other figures.

In the second Figure 48, activities in the market obviously increased. The major change in activity is observed for the larger systems in the lower section of Figure 48. The market activities are widespread, at this moment in time the market is flourishing. Besides the market activities which can be extracted from the different figures; the rise, decline and disappearance of business models can also be observed. This information shows the major development trends of the different business models over time and the corresponding focus of the various organizations in the market. In Figure 47, a variation of business models is at place in different sections of the market. The situation in 2010 shows an increased market activity accompanied with the rise of a number of business models. The following business model developments immediately draw the attention: The extension of the Small-scale (Twinergy) business model to the ownership side of the figure; the rise of the Leasing (Belfius); Additional (Bostoen); Consulting (Zero Emission Solutions) and Collective purchase (Zero Emission Solutions) model; the discontinuation of the Cooperative (Ecopower); and the Utility Scale (Sun Projects) model.

The extension of the Small-scale (Twinergy) business model to the ownership side of the figure visualizes the extension of the potential market by (Twinergy). This was discussed in the previous section (Twinergy). The rise of the Leasing model (Belfius) in the same side of the figure is the following interesting development. Both business model developments took place in the ownership of the facility side of the figure. These models had in common that the systems was owned by the executing organization. To be able to act in this side of the figure increased financial resources are needed. The extension of both business models indicates a reliable investment market.

The rise of the Additional (Bostoen), and the Collective purchase (Zero Emission Solutions) business model are both in the residential area. These models are both developed by new organizations in the market and seem to be attracted by the good conditions of the market. The Consulting (Zero Emission Solutions) model was applied by the same organization as the Collective purchase (Zero Emission Solutions) model. This model is acting in the lower side of the figure but seems to be attracted by the increased market activities and therefore the need for additional information provision.

The discontinuation of the Cooperative (Ecopower) and the Utility (Scale Sun Projects) business model explains the inefficiency of these models. The models disappeared when the market was flourishing. Both organizations (Ecopower and Sun Projects) focused on other business models in other sections of the markets. The firms experienced higher efficiency in these markets and therefore stopped with these models.

In the last Figure 49, all market activities have shrunken. In 2012 this situation has changed to a large extend for every section in the market. The main decrease can be observed in the lower part of the figure. In general the market activities shifted upwards and almost disappeared in the ground mounted and the lower region of commercial part in the figure. The organizations with business models focusing on large systems have lost the largest market share compared to the previous years. The Renting (Enfinty); Leasing (Belfius); Consulting (Zero Emission Solutions) and C & I Service provider shifter upwards in the figure. The organizations were forced to make this shift due to the decreased potential market. This means the activities for the large systems diminished and led to a more centralized focus of the different organizations in the market. The market is now concentrated on the upper part, so on the smaller and residential systems. The only activities left in the ground mounted systems are the M&O and the Virtual power plant. These activities are still at place since they deal with systems build in the past.

Another noticeable observation is the returned focus of the Small-scale model to pure service section of the figure. A shift in orientation is also observed in the other business model active in the left side of the figure. The business models in which the system was owned by the executive organization are all gathered in the upper section of the commercial part of the figure. The activities almost stopped in the ownership sided of the figure and the organizations changed their focus to the smaller systems. The market uncertainty caused a declined investment market. The business models in this area became inefficient. Therefore they were forced to refocus on the smaller commercial section, schools became their major target market. As explained in the B2B model because the electricity prices were better to compete with, green energy netting and the new obligation to produce renewable energy when (re) building schools (explained in section 5.3.2).

The comeback of the Cooperate (Ecopower) and the foundation of the market stimulation (REScoop.be) model are two remarkable developments. Both models were recently introduced on a difficult moment in time. Both business models are applied by cooperative organizations that have slightly different targets than the other organizations in the market. The variation of the goals of the different business models is explained in the next section.

6.9.3 Goals of organization

Another finding after the research of the various business models in Flanders are the differences in the goals of the organizations. This cannot be observed in the figures but is a noteworthy finding for the overall pattern of the business models in the market. The goal of an organization has its impact on the type of business models. The developed majority of the initiatives in Flanders have as main goal, gaining the highest profit. Except for the cooperative business models, their main goal is somewhat deviated of the other organizations in the solar energy market. These cooperative organizations aim to increase the responsible use of energy by the implementation of renewable energy or energy savings. Due to this social goal they are not restricted to the limited number of optional projects that are financially the most efficient. The initiatives have a lack of increased financial benefits due the additional actions. As a result different initiatives are observed in the market. These initiatives provide extra actions on top of the provision of PV systems. The finding of these business models can therefore be explained by the lack of the necessarily need of increased financial profits. Therefore the commercialized part of the solar energy market is excluded from the creation of some business models thanks to the boundaries provided by the financial restrictions.

Also the goal of commercialized organizations is not always similar. The role of the utilities in the market is a bit contradictory. The utilities prefer the market to remain decentralized to be able to continue their role energy market. These preferences probably explain the limited role of the utilities in the solar market. Eneco is the utility that provided most PV in Flanders (Greenpeace.org). They implemented 6.000 PV systems in Flanders, this is only several percent of the total market (2013; Eneco.be, 2013). Eneco applies two Turnkey models; the Small-scale installation model; and the B2B model. In both models they outsource every step of the business model and are using their name as marketing tool to purchase the systems.

After positioning the different models in Flanders over time and observing the various findings the next step in the analysis needs to be taken. From the figures it is easy to observe the shifts of the business models over time. However it is more difficult to conclude the direct origin of these developments. The next paragraph will therefore discuss the linkages of the business model shifts and the relation to legislative developments that were found during this research. At first both developments are shown in a table and thereafter in a timeline. The overviews will simplify linking both developments. Next the models will be categorized using three categories of governmental policies extracted from Ayoub and Yuji (2011) and their impact on the various business models.

6.10 The connection of Business models and the legislative developments

The main goal of this chapter was to find the different business models applied in the Flemish market and their developments over time. Thereafter the interaction of the business model developments with the regulative developments of Chapter 5 is observed. This is performed with the help of Table 13 and Figure 50. Table 13 provides a useful overview of the business models developments, with an explanation and the developments per specific business model. Within this overview the legislative developments are shown directly behind the business model development. This provides an overview of the interactions of both developments: Figure 50 visualizes the interaction.

Table 13 Business models and related legislative developments in Flanders

BM name	Description	Size system	Start/end date BM	BM developments (+date)	Connected legislative developments (+date)
Turnkey Provider (6.1) *Organization provides the entire process of purchase, installation and after sales. The customer becomes owner of the system after the purchase.*					
Small-scale	The organization provides residential customer with a totally installed system.	< 10 kV	2004-2013	- Initial investment solely VAT payment (2009) - Ownership of system to player (2009) - Back to previous small-scale BM (2011) - Future developments, try to change mindset of customers to normal market (2013)	- VAT 6% for houses older than 5 years (2009/2010) in timeline - GSC compensation 350 euro (2009/2010) - Increased GSC compensation (2011)
Collective Purchases	Organization provides collective purchase of residential installation to reduce costs of the system. Information meetings, helpdesk and quality checks are provided.	< 10 kV	2011	- Start of the collective purchase (2011) - In future expected to be applied more often (2014)	- GSC compensation deadline 270 euro (2011) - Obligatory production of renewable energy in newly build households (2014)
B2B	Organization provides B2B customer with purchase and installation of the system.	> 250 kWP	2006-2013	- Restructuring of organization and adoptions to purchase schemes, due to caused deadlines to finish installation (2009- 2012) - Change of orientation towards smaller systems, between 10 -250 kWP. (2012) - Orientation to foreign markets (2012, July) - Future developments, try to change mindset of customers to normal market (2013)	- Adaptations to GSC compensation system over time (2009- 2012) - Decrease in compensation GSC (2011) - Compensation GSC 90 euro (2012) - Uncertainty about legislative developments as injection tariff and unprofitable top (2012) - Obligation (re) building schools to produce renewable energy (2013)
Build-own-operate rooftop (6.2) *Organization manages entire process of purchase, installation and maintenance. It is the owner of system, not the location and sells the electricity to the owner of the location or nearby energy consumers.*					
Renting	Organization manages entire process of purchase, installation and maintenance, and remains the owner of the system. The customer receives monthly fee for the rent of the location and decreased electricity prices €/kWh	> 250 kWP large	2006-2013	- Change of orientation towards smaller systems, between 10 -250 kWP (2012) - Optimized conditions are needed to be able to provide this model (2012) - Future application of model, no beneficial financial conditions for customer solely renewable energy supply as value proposition (2013)	- Decrease in compensation GSC (2011) - Compensation GSC 90 euro (2012) - Forced investments in renewable energy by large organizations/ Benchmark, new covenants (2012)
Leasing	The organization outsources the purchase and installation of the system, he owns the facility. A monthly fee is received from customer for the compensation of the investment. The customer sells the electricity to an owner of the location.	> 250 kWP large	2008-2013	- The start of this business model due to good support mechanisms (2008) - Orientation towards smaller systems (<10 kV) (2012, July) - Adaptation of duration of lease contract form 20 to 10 years (2012, July) - Future developments in this market are expected when electricity prices will rise so systems will be more profitable.	- High compensation of GSC (2008) - Compensation GSC 90 euro (2012, July) - Compensation GSC reduced to 10 instead of 20 years (2012, July)
Cooperative	Organization gathers investors for purchase of systems and executes the project	< 10 kV	2007 & 2009-	- Cancellation BM due to legislative changes and problems with existing systems due to relocating	- Cancellation of ecology premium (2007) - Liberalization of the energy market (2010)

	management. System is owned by cooperation and is placed at external location. Decreased prices €/kWh are applied for owner roof and cooperator.		2012	households (2007) - Reimplementation of BM, orientated to schools. Applicable due to decreased costs of systems combined with available support mechanisms (2009) - Creation of aberrant BM creation by other cooperative organizations (2010) - Cancellation BM (2012, July) - Increased electricity costs in existing projects due to implementation injection tariff (2013) - Future application of business model, combination with energy savings (2013)	- Compensation GSC 90 euro (2012, July) - Network tariff (2013)
Utility-Scale power producer (6.3) *The organization manages the entire purchase, installation and maintenance. The organization owns the system and the location. The renewable energy is sold to nearby energy consumers.*					
Utility scale	" same as general explanation	> 250 kWP large	2006-2008	- The start of this business model due to good support mechanisms (2006) - Cancellation BM due to focus on Build-own-operate BM (2008) - Is not possible anymore (2012, July)	- The implementation of GSC (2006) - Compensation GSC 90 euro (2012, July)
Value- added service provider (6.4) *The organization provides an additional service in one of the steps of the value chain, other than the installation or sale of the system. The organization does not own the system*					
Consulting	The organization provides specific additional information for (potential) owners of PV systems.	Mostly > 250 kWP large	2009-2013	- Information provision totally based on experience in the market (2009) - Due to over subsidizing no need for additional information for newly developed financial/BM constructions (2009-2012) - Information change to financial/ BMs to research for future possibilities in the market (2012)	- The implementation of GSC (2006) - Compensation GSC 90 euro (2012, July)
Market stimulation	The organization stimulates the renewable energy market due to the facilitation of information about the construction of cooperative organizations.	Mostly > 250 kWP large	2012-2013	- They were founded due to the increasing demand for information provision concerning the foundation of cooperative organizations (2012)	- Compensation GSC 90 euro (2012, July) - Injection tariff (2013)
Service and monitoring	The organization provides operation and maintenance activities for the owner of a PV system.	> 250 kWP large	2006-2013	- Start due to the sale of large systems (2006)	- The implementation of GSC (2006)
Construction and installation service provider (6.5) *The organization provides a service with less value added than in the value added model. The organization is specialized in one part of the supply chain.*					
Electricians	The organization provides the electric installation of the systems.	All	2006-2013	- Specialization towards solely installing PV systems (2006)	- The implementation of GSC (2006)
Physical installation	The organization provides the physical installation of the systems.	All	2006-2013	- Specialization towards solely installing PV systems (2006)	- The implementation of GSC (2006)
Virtual power plant (6.6)					

The organization is a virtual operator that owns and is in charge of the management of the grid. The organization knows all consumption and production patterns in the market.					
Network Operator	In Flanders this are now governmental assigned organizations who have limited commercialization opportunities. Not possible to enter market by other parties.	All	2006-2013	- The assignation of the government will end (2015) - Future possibilities liberalize the network and apply newly developed BM	- Liberalization of the energy market (2010)
Other business models (6.7) *These business models do not fit those models applicable for utilities as explained in Schoettl & Lehmann-Ortega (2010).*					
System sales	The organization is solely provides the sales of the panels without additional service.	All	2006-2013	-	- No specific causes
Additional	The organization provides the customer with solar panels as addition to another service.	<10 kWP	2010-2013	- In the future the market is expected to expand (2014)	- Obligatory production of renewable energy by newly build houses (2014)

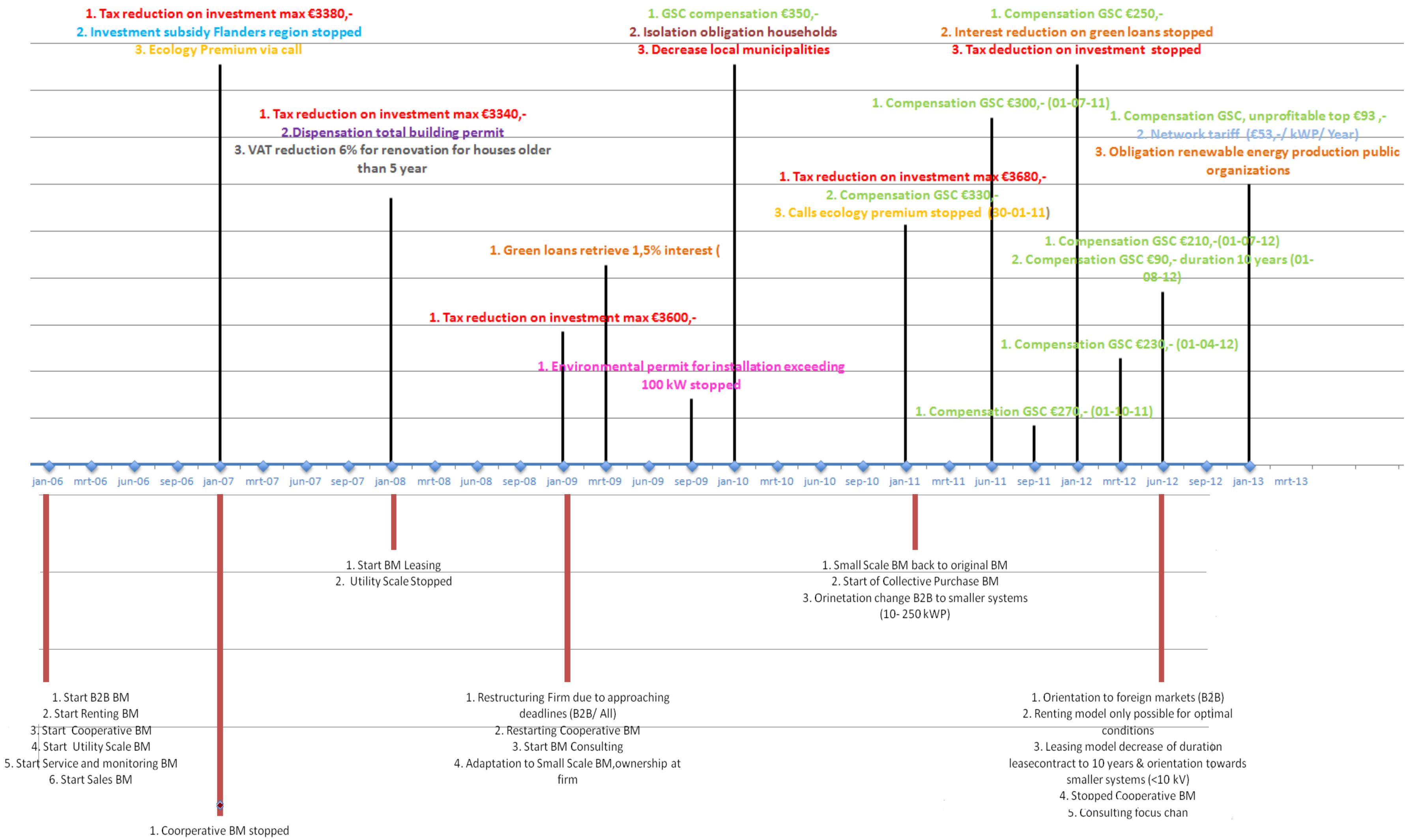


Figure 50 Timeline Policy and Business model developments (2006-2013)

Main findings on the linkage of legislation and BM developments

In the previous Table 13 shows an overview of all the linkages between the different business model developments and the connected legislative changes over time. The following sections are a summation of the most often observed causes of business model adaptations.

6.10.1 Influence GSC

One of the main legislative changes that is of influence on almost every business model, is the GSC mechanism. The GSC mechanism, implemented in 2006, is observed as the main motivation of the creation and the rise of the different business models. Thanks to this mechanism the various organizations were able to make a profitable business case in 2006. The business models corresponding to these organizations changed almost simultaneously with the developments of the GSC mechanism. As already discussed the compensation of the GSC was reduced drastically since 2010. The reduction caused some positive and negative effects for the business models in the market. At first the announcement of the increased compensation for the GSC gave the market some major impulse. The decreased compensation in the future motivated potential buyers to purchase and install their systems before the transition date. In this manner the customers could still profit from the GSC compensation to gain the highest overall financial efficiency of the PV systems.

A. Rise of business models

Directly after the implementation of the GSC mechanism the rise of several business models was observed. The business models initiated by the implementation of the GSC mechanisms were mostly oriented towards new constructions, removing the initial investment for the customer. Within the newly developed models the ownership of the facility shifted to the organization instead of the customer. The rise of the Leasing, Renting and Cooperate business model were directly caused by the implementation of the generous GSC mechanism since 2006. These models also lost most market activity after the decreased GSC compensation, this is discussed in section E orientation switch.

B. Organizational changes

Besides the positive stimulations of potential customers the tariff reductions also caused pressure on the market for the organizations. The installation companies of the PV systems were now confronted with approaching deadlines. The deadlines were created because of the fact that all customers insisted the installation of the PV systems to be completed before the implementation of the reduced tariff. The deadlines were at the start of every year, but rapidly the timeframe of the introduction of new decreases in compensation changed. In 2011 the compensation changed every three months and simultaneously the approaching deadlines. Adaptations to the different organizations were necessary to be able to keep up with these changes to the supporting mechanism. The increased importance of the response time, while maintaining the requested quality, was mentioned as one of the major pitfalls for organizations in this period (Bertand, 2013).

C. Fluctuating regulations

Besides the adoption pace of the to the GSC mechanism, the unpredictable and fluctuating regulations concerning this and other supporting mechanisms influenced the market drastically.

Different interviewees explained the lack of clear policies to be the major obstruction for the further development in the solar energy market. Most agreed upon the existence of the so-called over-subsidizing due to the GSC mechanism till 2011. Some mentioned the reduction of GSC not to be the main cause of market decrease, but the indirect influence of the uncertainty concerning the GSC mechanism. At first, the reduction of the compensation would last until 2016, but in 2012 the government decided to shorten this period and speed up the reduction to finish in July 2012. These changes on short notice made it almost impossible for organizations to adapt their business models to the regulative changes. The vague regulatory developments also caused a repulsive reaction of most of investors in the PV sector.

D. Over- subsidies

As shortly introduced in the previous section over-subsidy was recognized in the Flemish market. Over-subsidy is a way of subsidy but this high that is leaded to a negative effect. This over-subsidy was mostly caused by the high compensation for the GSCs mainly in between 2008 and 2011. Several organizations nominated the presence of over-subsidies as the main reasons of "poor" business model developments in the market. In the first stages after the implementation of the GSC the various organizations were eager to develop new ways to expand their potential market. But the recognition of the over-subsidy by various organizations in the market caused them to stop developing new business models.

E. Orientation switch

The decreased compensation of GSC caused orientation shift of the organizations active in the commercial and ground mounted market. The organizations previously focused on large systems exceeding 250 kW because the organizations were able to receive the largest profits with this orientation. In this situation the economies of scale provided them with low implementation costs and the GSCs covered the difference in electricity prices. After the decreased GSC compensation the organizations were forced to change their target market since the large systems were no longer profitable. The electricity prices of the PV systems were no longer able to compete with the low energy prices of large consumers, since the GSC compensation was too low to cover the difference. The smaller installations can compete with higher electricity prices and are therefore more interesting. As previously stated schools are in particular now the main target group. Schools purchase electricity to higher prices and are able to make use of green energy netting. Therefore the business model in this section is still profitable but the market is small. The schools are an interesting market though since they are obligated to produce renewable energy when (re) building a school since the newly implemented law (5.2.3) on January 1st, 2013.

6.10.2 Long and short-term effects of regulatory developments

Both the timeline and Table 13 show the developments of the business models and legislation in Flanders. The information extracted from the table, time line and interviews is used to compose the newly developed Table 14. This table provides a more general overview of governmental actions and their influence the market. The table provides a quick view of the governmental changes and their impact on the development of a specific business model. These findings could be helpful for governmental decision making since they can see what the governmental change will do to the market.

Within the table a division of the following three governmental regulations is used: Compensation for the green certificates; Quota obligations; and Subsidies and taxation. The division of governmental regulations is extracted from the article of Ayoub and Yuji (2011). They divide the renewable energy promotions strategies into four main categories: Feed-in Tariff; Quota obligations; subsidies and taxation and unstructured initiatives. The Feed-in Tariff is explained as governmental determined renewable electricity prices so that the network operators will purchase the electricity with a suitable profit margin to ensure the market competency. This policy is similar the minimum compensation for the GSC and therefore applicable to the Flemish case. The GSC mechanism is observed separately from other subsidies since it has by far the largest impact and is applicable to all PV systems, no exceptions possible. The second promotion strategy is the quota obligations; a certain amount of renewable energy should be produced by energy producers and this is regulated by the government. These quotas also are similar to those applied in Flanders, which obligates the energy suppliers to generate a certain amount of GSC with respect to their total electricity sales. The third strategy is the promotion with the help of subsidies and taxation. In this strategy subsidies are provided to reach a certain goal of the country and taxation is favorable to renewable energy development and aims at the decrease of conventional energy production. The federal and Flemish government provide numerous subsidies and taxations. The last strategy found is the unstructured initiatives this is explained as supporting programs not related to the general plan of the country (Ayoub and Yuji, 2011). Since in this research project only governmental promotion strategies were observed this fourth strategy is not implemented in the table.

The different promotion categories directly and indirectly influence business model developments. The business model developments directly caused, or at least within six months after the implementation of the policy change, are represented in the short-term column. The business model developments that are caused by the policy change after more than a year are represented in the long-term column, . When the business model is created after the regulative change the name of the model is depicted in green. In case the model diminished because of the regulative change, the color is red.

Table 14 Development of promotions strategies versus business model

	Increase		Decrease	
	Short term (< 6 Months)	**Long term (>6 Months)**	**Short term (< 6 Months)**	**Long term (>6 Months)**
GSC compensation	*B2B (E)* *Small Scale (T)* *Consulting (Z)* *O&M (SA)*	*Rental (E)* *Leasing (B)* *Cooperative (Ec)* *Utility Scale (S)* *Collective Purchase (Z)* *Additional (Bo)*	Rental (E) Leasing (B) Cooperative (Ec) Utility Scale (S) *Consulting (Z)*	*Cooperative (Ec)* *Market stimulation (R)* *Rental (E)* *Collective Purchase (Z)*
Quota obligations	*Rental (E)* *Leasing (B)* *Cooperative (Ec)* *Consulting (Z)* *O&M (SA)*	Rental (E) Leasing (B) Cooperative (Ec) *Additional (Bo)*	Rental (E) Leasing (B) Cooperative (Ec) *Consulting (Z)*	*Market stimulation (R)*
Subsidies and taxation	*B2B(E)* *Small Scale (T)* *Consulting (Z)* *O&M (SA)* Additional (Bo)	*Leasing (B)*	*Consulting (Z)*	*B2B(E)*

** Belfius (B), Bostoen (Bo), Enfinity (E), Ecopower (Ec), Elia (EL), REScoop (R), Sun Projects (S), Solar Acces (SA), Twinergy Suntile (T), Zero Emission Solutions (Z)*

* Red and underscore are business models negatively influenced by regulative change

**Green and italic is the rise of a business model due to a regulative change*

Several findings can be observed from the table. In general the regulative changes caused more green than red influences. This means that more positive than negative effects on business model developments are observed by changing policies. The impact of an increased and decreased stimulation also provided interesting findings. Increased stimulation policies did not always show opposite effects as the same regulation being decreased. In several situations business models did not disappear when the promoting strategy decreased. Several explanations to this finding can be given. The first explanation is that the organizations became active in the market and after the decreased compensation did lose market potential, but remained in the market with less activities. This can be explained because a number of (often newly founded) organizations were attracted by the positive market conditions after an increase of a promotions strategy. The organizations settled in the market and were thereafter confronted with decreased conditions. Although it did influence their activities and potential market opportunities they remained in the PV market since it is the organizations' core business.

Another explanation are the decreased prices for the PV systems and other improved conditions. The decrease of a certain promotion strategy happened several years after the implementation of a business model. Within the time span in between the launch of the business models and the decrease of the promotions strategy other conditions also changed. Therefore, the overall business model became more efficient and was capable to survive without the supporting mechanism. Various conditions can change over time such as: the price of the PV systems; the efficiency of the distribution network of the organization and improved installation facilities. All of these result in lower costs for the organization. Besides these more general observations, the difference in long and short term effects of the individual promotion strategies provides an interesting source of information. These will be discussed below.

A. GSC compensation

In the GSC compensation column numerous developments can be observed. The increased compensation of GSCs (in 2006) influenced the development of almost every business model in the market. In the short term the increase stimulated the development of business models such as the B2B and Small Scale business models. For the long-term the increased subsidy resulted in the development of other business models. After a while (long-term), different firms in the market noticed the market opportunities due to the increased subsidies and implemented the Rental and leasing business models. An interesting observation is that in most of the models that evolved on the long term, the facility was owned by the organizations instead of the consumer. In the case of the compensation decreases the effects were different. On the short term various business models stopped directly after the decreased compensation. In contrast with the rise of the cooperative business model on the long term. This model adapted to the decreased circumstances and changed their business model a bit to be able to apply the model again.

B. Quota obligations

The most interesting observation in the Quota obligations column is the disappearance of several business models on the long term, for increased quotas. This can be explained by the lobby activities of the utilities. The utilities were forced to make increased costs due to the quotas resulting in extra costs because of the GSCs they were obliged to buy. The utilities stated that the GSC compensation was too high and that this directly caused increased electricity prices for consumers. The lobby activities caused an accelerated implementation of the GSC compensation reductions by the government. The lobby activities and the reaction of the government took place several years after the increased quotas. Therefore, the increased quota caused the disappearance of various business models on the long run. This is in contrast with the impact of the quota on short run as this stimulated the rise of several business models. This is also a good example of the connectedness of the three promotion strategies which will be further explained in the next limitation section.

C. Subsidies and taxation

The impact of subsidies and taxation seems to be of less influence on the development of the business models. The observation that stands out the most is the rise of the Leasing business model on the long term. Belfius, the bank who applied the Leasing model, explained that the Leasing model is dependent on the possibility to deduct profit taxes for organizations in the market. The possibility to deduct taxes, when producing renewable energy, was already at place for a longer period. In the beginning the other conditions were not good enough to implement the business model. After a while other conditions changed in the favor of this model what provided enough possibilities to implement the Leasing model. Therefore taxation was only of influence on the Leasing model on the long term.

Limitations

The table can be seen as a first attempt to generalize the influence of various policies on business model development. However, more research is needed to confirm the robustness of the findings. A number of limitations to the above findings were observed:

A.

One limitation is the generalization of the various regulations into a division of three main policies. It is questionable whether it is possible to generalize the effect of various regulations to the development of a business model. Also the generalization of short and long term effects. The durations of the terms and their relating impacts can vary per specific promotion strategy and business model.

B.

Another limitation can be found in the interconnectedness of the three general policies. Combinations of the various promotion strategies are also observed. Therefore it is sometimes difficult to state which regulative change created what business model development. An example is the long term influence of the taxation on the Leasing contract as explained in the previous section.

C.

Finally, some influences of regulation to business model development are excluded due to focus on promotion strategies only. The table provides no option to show the impact of the regulations in Flanders that restricted the development of certain business models. The influence of these restrictions was already discussed in the previous paragraph 6.10.1.

Even though there are various limitations to the table it provides in interesting insight in the different impacts of the various policies. The table can be seen as an initiative to generalize the influence of general policies. More research is needed to confirm the robustness of the findings. This could be an opportunity for future research. Table 14 provided an overview of the various influences of governmental regulations on the business models in the market. This table can be seen as the summary of the findings of this research project.. In the last chapter the main findings of this project will be discussed, the answers to the research questions will be formulated and a final conclusion of the influence of policies to the development of business models of PV systems in Flanders will be drawn.

Chapter 7 Conclusion, discussion & future prospects

Within the previous chapters the overview of the different actors in the Flemish market, the policies and the various business models was created. The last part of chapter 6 clearly described the main linkages between the different regulations and the business model developments. With the help of these and all other findings the answer to the research question of the thesis will be given in this final chapter. A recap of the research question:

- *How did the legislative changes interact with business model development in Flanders from 2006 till 2012?*

Within the following section the main conclusion of the linkages between the regulations and business models will be discussed using the most noteworthy findings from the Flemish market.

7.1 Conclusion

Since 2006 the Flemish PV market experienced an enormous growth. The presence of the three factors of market growth indicated by Pinkse and Van den Buuse (2012) were all detected in the beginning of the market growth. The solar panels increased in efficiency and a cost reduction was realized thanks to the large-scale diffusion (Pinkse and Van den Buuse (2012); Sandén, 2005). Also the market entrance of numerous organizations influenced the developments path of the PV systems. The competition in the market focused on high quality instead of price. Therefore technological developments were highly stimulated (Polfliet, 2012). Numerous policy improvements were observable which allowed the development of the market to exceed the opportunities of a niche market.

Opportunities

In the literature the discussion concerning the creation or discovery of the origin of an opportunity is ongoing (Eckhardt & Shane, 2003; Renko et al., 2012). Within the Flemish market there were no examples of ordinary opportunity creation observed. The development of the business models was mostly influenced by legislative changes. The legislative changes in 2006 caused shifts in the balance of the market and therefore created a source of opportunities in the Flemish market (Eckhardt & Shane, 2003). The legislative changes are solely caused by the government; the different parties in the PV market have little or no influence on the decision-making process. Therefore the opportunities in the Flemish market are best described as objective phenomena that exist in the environment; entrepreneurs who are alert and act on these opportunities swiftly take the upper hand in the market (Renko et al., 2012).

Business model patterns

The implementation of the minimum compensation for the GSCs in 2006 clearly shows the rise of market potential. The legislative changes influenced market opportunities and were therefore the motivator for the business model developments. Various organizations anticipated on the new business opportunities with the development and implementation of different business models. A number of patterns were observed concerning the development of the different business models. The various business models in Flanders were positioned in the figure of Schoettl & Lehmann-Ortega (2010). Two main variations to the original figure came to light. Firstly the use of various business models within one circle. The six generic business models, represented by the circles, are also composed out of several differentiated models. But in between those models only small variations were noticed, such as: the quantity of outsourced steps or the customer group. A number of business models observed in the Flemish market varied on aspects that were not comparable to those of Schoettl & Lehmann-Ortega (2010). Several single organizations applied combinations of business models to capture value for the organization and expand their potential target group. The motivation for the use of combined business models is in line with the statement of Chesbrough (2010). The additional developed business models in the Flemish market provided the organizations with increased chances of economic success (Chesbrough, 2010). The increased variety of business models led to the widespread diffusion of PV systems. In most new business models, developed in the flourishing market, the ownership of the facility shifted from the customer to the organization. In general most business model developments were observed in the area of the larger systems. The largest profit can be gained in this section of the market by the economies of scale, but higher margins are needed to be profitable. The higher margins are necessary because the larger systems have to compete with lower electricity prices. Another observation was the differences in the goals of the organizations. The differences have their impact on the type of business model developed. The developed majority of the initiatives in Flanders have as main goal, gaining the highest profit. Except for the cooperative business models, their main goal is somewhat deviated of the other organizations in the solar energy market: their goal is to act socially responsible and act in the best interest of the community. Due to this social goal they are less restricted to financial limitation of projects, this resulted in a number of aberrant initiatives.

The second distinction is the seventh circle, representing the additional business model, in the new figures. The new circle is a business model observed in the Flemish market and is an addition to the figure of Schoettl & Lehmann-Ortega (2010). Most business model patterns were directly linked with the change in legislation; therefore some of the general developments are discussed within the next section.

Effects of the GSC mechanism

Positive effects GSC

The GSC mechanism has highly influenced the development of business models in various ways. Interesting are the differences between the long-term and short-term impacts of the GSC regulatory changes on the development of the business models. In line with the statements by Charters (2001) and Balachandra et al. (2010), the diffusion of PV systems in the market was positively influenced by the development of purchasing schemes. In the first stage after the implementation of the GSC various organizations were eager to develop new ways to expand their potential market. With the help of innovative business models the organizations expanded their market share (Boehnke and Wüstenhagen, 2006). In this flourishing market several new business models were developed, in the newly developed models the ownership of the facility shifted to the organization instead of the customer.

Negative effects GSC

Unfortunately the regulations were not just positive for the stimulation of the Flemish market. The downside of the mechanism was partly caused by the generous minimum GSC compensation on the long run. The compensation for the GSC was very high, which caused an enormous imbalanced market growth. Different organizations in the market recognized the presence of over-subsidies in 2009 and 2010. The over-subsidy was mainly a result of rapid cost decreases for the PV panels and slow governmental reaction towards these reductions. Several organizations nominated the presence of over-subsidies as the main reasons of "poor" business model developments in the market. The lower PV system prices increased the overall efficiency of the models in the market and the need for further business model development diminished. In the long run the policy created a reversed effect compared to the short run. The existing organizations in the market did not develop new business models although new firms who entered the market observed new business models. The new initiatives were mostly implemented by organizations that act on several markets. For example the Additive business model, the organization was not solely dependent on the development on the PV market and created a model wherein the PV systems were an addition to their core activity.

The negative impact of the over-subsidy was mainly caused by a mechanism that became too expensive. Several Interviewees explained the large installations to be one of the main causes of the failure of the GSC mechanism. The widespread implementation of large installations and the need for corresponding GSC compensation made the mechanism unfeasible. Balachandra et al. (2010) emphasize the importance of the presence of a universal and unlimited applicability of the support mechanism to promote diverse commercialization, for a sustainable policy. This statement was contradicted by various organizations in the market who indicate the reversed influence of the unlimited implementation

The rapid growth pace of the PV market changed the impact of the GSC mechanism on the grey energy prices. The increased costs of the GSC mechanism directly caused increased grey electricity prices. The system operators started a lobby to increase the awareness of the higher electricity costs due to the installed PV systems. As a result the Flemish population demanded declined compensations for the GSCs for solar energy. The Flemish government responded with a rapid decrease of the compensation of the GSC. This was the only functional lobbying effect observed in the Flanders. Other policy changes were hardly influenced by the lobby activities by organizations in the market, which were all gathered in PV Vlaanderen.

Another downside of the GSC mechanism in Flanders is the manner the GSC compensation reduced over time. The GSC mechanism was implemented to create a durable energy market. A durable market needs to be able to survive in the future without the necessity of financial support. This can only be achieved when the support mechanism is proportionally degraded with the future needs of the market (Sandén, 2005). The proportional decrease is needed to provide the market with the opportunity to adapt to the changing circumstances. Within the Flemish GSC mechanism the degradations were far from proportional and caused a major market disturbance. The policy in Flanders was therefore doomed to fail, and this was exactly what happened. The organizations were not able to adapt their business models to this changing environment due to a lack of time. Also because of the new deadlines that were created by the approaching decrease in GSC compensation, customers demanded the systems to be installed before the implementation of the reduced GSC compensation. The increased pace of the approaching deadlines forced the organizations to restructure the firm in such a way that it was possible to keep up with this pace.

Fluctuating

The fluctuating policies of the Flemish government were also a problem in the compensation reduction process. The GSC mechanism was not only unstructured, the adjustments were also published short before actual implementation. The regulations of the Flemish government changed several times and on short notice. Numerous organizations mentioned these fluctuating policies, and not the actual decrease of the GSC compensation, as the main cause of the diminished Flemish market since July 2012. The organizations were not able to adapt sufficiently to the unpredictable changes

The vague regulatory developments caused a repulsive reaction of most of investors in the PV sector. In previous years many investors were willing to invest in the PV systems, which is in contradiction to the statements by Wüstenhagen and Teppo (2006). They state the renewable energy market to be a difficult investment branch due to the long terms of the investments. In this research project it came to light that the long time span of the investment motivated banks to participate. The banks had the opportunity to invest in renewable energy with a guaranteed profit because of the supporting mechanism in Flanders was set for 20 years. The vague regulative conditions in the market changed the this willingness into an aversion of the investors.

Conflicting

During the composition of this thesis several findings were made concerning the regulation patterns in Flanders and Belgium. The most obvious observation is the large number of legislations influencing the PV market in Flanders. More than 20 different legislations reflect on the market since the start date for this research in 2006. Institutional differences between countries and regions are a barrier to the widespread diffusion of the technology (Provance et al., 2011; Charters, 2001). Complicated structures and sometimes controversial interests of the different governmental layers can be designated as the cause of various conflicts observed in the Flemish market. Several examples are demonstrated in this research project of conflicting legislations due to the different governmental layers and their deviating policies. The most recent development of the network tariff shows a clear example of the conflicting responsibilities. The federal governmental introduced the law that gives the system operator the right to set a fee on the use of the network. For two years the Flemish government applied a dispensation for renewable energy technologies, even though they were not entitled to do so. The verdict of a lawsuit against the Flemish government forced the Flemish government to adopt the network tariff. The organizations in the market waited till further notice, in reaction to the uncertainty because of the verdict. This reaction caused delay on the development in the market. Therefore legislative and institutional barriers need to be removed to be able overcome the existing boundaries to business model development and the widespread diffusion of PV. What can be concluded from this and other observations in the Flemish market is that national based regulations for renewable energy are highly recommended.

Restricting

Three examples were observed where regulations directly restricted the development of a business model. The Leasing model for residential installations was restricted by legislation since leasing for consumers in Belgium is linked with very strict regulation to protect the consumer from missteps in lease constructions. The second business model, which is restricted, is the virtual power plant operator. This business model is not possible in Flanders since both the distribution, as the transition networks are owned by governmental assigned organizations. This makes it impossible to enter or compete on this market and the government maintains high restrictions. The third restriction was observed in the Additional model. Consumers waited with the purchase of a PV system till five years after moving in their newly build houses. This behavior was caused by the tax reduction from 21% to 6%, for houses older than 5 years. The stimulation regulation actually kept consumers from purchasing PV systems simultaneously with their house and postponed the action five years.

Final conclusion

The following overall conclusion can be drawn about the Flemish PV market. The Flemish government created an artificial flourishing market with the generous GSC mechanism. The mechanism caused shifts in the balance of the market and is therefore recognized as the main source of opportunities; no further opportunity creation was observed. On the short run the organizations applied business models were the ownership of the facility shifted towards the organization instead of the customer. In the long run the organizations were not further stimulated to develop creative business models to help to overcome financial barriers, due to the presence of over-subsidy. The GSC compensation decreased in a rapid and unstructured pace, this caused a major downfall in the business activities and the opportunities of business model development. Numerous regulative restrictions to developed business model were observed in the market. These findings underpin the influencing factors to the commercialization of renewable energy by Schleicher-Tappeser (2012), the motivator of the research. Diffusion of PV in the Flemish market is influenced by the ability of market players to develop and adapt appropriate business models for a specific situation in which the organization is acting, and the potential developments of the regulatory system.

7.2 Future prospect of the Flemish PV market

One of the main findings after observation of the different business models in Flanders is the major fallback the entire PV market experienced in 2012. The interviews took place shortly after this period and most organization did not respond to the changes in the market yet. The different expectations of the future developments in the market were mapped during the interviews as well. Within this section the expectations of the various organizations concerning future developments of the

Flemish PV market will be discussed. The focus will be on expected opportunities caused by legislative changes.

The fluctuating policies in the solar energy market caused disturbances in the market. Various organizations were influenced by the vague developments of the different policies. One example is the recently implemented network tariff. As mentioned before, the publication of the law related to the network tariff was uncertain till a month before the actual implementation. The uncertainties concerning this tariff stagnated the developments of various organizations in the market. In December the actual content and conditions of the tariffs were published. Various organizations explained this moment to be a new start for the PV industry. After years of uncertainty concerning the diverse policy changes a less subsidized but more secure market is created. The increased certainty in the market is expected to be a motivator for organizations to make a restart in the new Flemish PV market. In this new market an increased number of smaller projects are expected. The impact of the implementation of the network tariff is expected to be limited on the short term. However it could become the motivator to new business models with a more dominant role for smart gird technology and energy storage. However, these technologies are still in the development phase. Creative solutions towards the commercialization of the PV systems are needed now the generous financial market conditions diminished. Various organizations pointed out their increased activities in the development of new innovative business models. One interviewee discussed their increasing interests in some of the Dutch business models; this interest was mainly initiated by the decreased compensations in Flanders.

An interesting initiative is arising in the market that underpins the previous existence of over-subsidizing in the past. Various investors in the market want to purchase the PV systems installed before 2012. Some systems are on the market again because several organizations with PV systems on their roof went bankrupt. The business model the investors want to apply is the renewed version of the previous renting model. The increased demand of the purchase of second handed PV systems, and their corresponding subsidy rights, underpins the former positive financial environment in Flanders.

In January 2014 the law for a minimum share of renewable energy will be implemented. As mentioned before this law obligates newly build residential houses, or those that are substantially rebuild, to produce a certain amount of renewable energy. The implementation of the law is expected to impact every renewable energy technology. The major growth rate is particularly expected in the PV market since the installation process is relatively easy. For the organizations in the residential market the implementation of this law will therefore result in the extension of their potential market. In particular the Additional business model, in which the solar panels are offered additionally to a newly build house, seems to become positively affected by this development.

A speculative future possibility is the implementation of the Virtual power plant business model. The assignation of the new contracts for the organizations that manage the networks will end in 2015. This could make it possible for other organizations to enter the market and therefore apply the Virtual power plant business model. Within the virtual power plant model the knowledge of the production and demand of the market is used as main value proposition (Schoettl and Lehmann-Ortega, 2010).

Another opportunity for future market development in the PV sector is the Benchmarking agreements. As mentioned before, these are covenants with various large organizations in Belgium that were signed since 2003 (Benchmarking.be, 2013). In these covenants the different organizations agree to invest in the production of renewable energy. These investments were aimed to cover parts of their energy consumption with renewable energy. The investments obligations provide a major market potential for PV systems. Normally the PV systems would not stand a chance to compete with the electricity prices for these large organizations. For the larger organizations the price for the energy and systems is of less concern, the production of green energy is their main goal. Because these organizations are obligated to produce more renewable energy in the future, developments in this area are expected. Different organizations mention the covenants as one of the key drivers for the possible implementation of large systems in the future. The business models in this "new" market are expected to stop competing on decreased electricity prices. This is in contrast to previous models, as for example the Renting model, where decreased electricity prices were offered to the roof owners.

Previously investments in PV systems were solely performed to gain financial profit from the installations. The change of interest by the covenants provides some major opportunities for the organizations orienting on the larger systems in the PV market. In the future the mindset of the investor needs to shift, so that new opportunities can arise and innovative business models can be developed. This shift in mindset was already discussed in the B2B model but reflects on the entire PV market. As stated by Bertrand (2013):

"Jumping in a tepid bath after a warm bath, feels like jumping in a cold bath".

The people in Flanders need to recognize the bath being tepid and not cold. The shift will cost some time but in the future is expected to provide some major expansion of the market.

7.3 Contribution, limitations and future research

Besides the insight in the various policy and business model developments in Flanders this research contributed to the existing literature on several levels. First, the research confirms the statements by Schleicher-Tappeser (2012) of the direct connection between the regulations and business model development and the commercialization of renewable energy. The applicability of the framework of Schoetlle and Lehmann- Ortega (2010) was also tested for the Flemish market. Various weaknesses of the original model came to light and therefore improvements were made. These improvements increased the usability of the model for the proper visualization of business model activities in the market. Finally the division of the various policy manners was used to create an overview of the different types of policy changes influence a business model development on both short and long term. The linkages provide a new manner to connect policies with business model developments. Since this was a first attempt, a number of limitations to this model were discussed as guidelines for future research.

Additionally, future legislative developments are expected in the Flemish market, which will have their major influence on the developments of newly created business models. The implementation of the network tariff and the resulting stability of the market will initiate business model development. The timeframe of this research is too short to picture business model developments in times of high and low support. It would be interesting to continue the observations of these developments.

Another limitation of this research is that the interviews were held with only one organization per business model. The developments of these specific organizations are now used to draw a general conclusion. Since most business models were used by various organizations, these observations could have varied if other organizations were chosen.

Besides future research in the Flemish market the connection between specific regulative changes and business model development will also be an enormous source for future research. The comparison of the Flemish with the Dutch market could result in interesting findings. Both markets are geographically very close but deviate a lot. Both countries applied totally different supporting mechanisms. In the Netherlands there was hardly any support over the last decade, in Flanders an opposite pattern was observed. With the overview of the developments of the Flemish and Dutch markets the influences of both poor and strong supporting mechanisms can be compared. This will also gain insight in the impact of the support mechanism on the creativity and innovativeness of the developed business models.

References

Publications

Aanesen, K., Heck, S., Pinner, D.(2012). Solar power: Darkest before dawn. *McKinsey on Sustainability & Resource Productivity,* Spring May 2012.

Agentschapondernemen, 2005. Ecologiepremie algemene informatie. Ministerie van de Vlaamse Gemeenschap, afdeling Economisch Ondersteuningsbeleid, 12 december 2005.

Amit, R., Zott, C. (2001). Value Creation In E-Business. *Strategic Management Journal 22*: pp. 493–520.

Andries, P., Looy, van, B., Lecocq,C., Debackere, K.(2007). New Ventures In Emerging Industries: Approaches to Business Model Adaptation. *RENT XX Conference*, Brussels, Belgium, November 22-24.

Asmus, P. (2008). Exploring New Models of Solar Energy Development. *The Electricity Journal, Vol. 21, Issue 3. April 2008*, doi:/10.1016/j.tej.2008.03.005.

Ayoub, N., Yuji, N., 2011. Governmental intervention approaches to promote renewable energies- Special emphas is on Japanese feed-in tariff. *Energy Policy, Volume 43*, April 2012, Pages 191-201

Baden-Fuller, C., Morgan, M.S.(2010). Business Models as Models. *Long Range Planning*, *43 (2010)*, pp. 156- 171.

Balachandra, P., Nathan, H.S.K., Reddy, B.S.(2010). Commercialization of sustainable energy technologies. *Renewable Energy 35 (2010),* pp. 1842–1851.

Boehnke, J., Wüstenhagen ,R. (2006). Business models for distributed energy technologies evidence from German cleantech firms. *Manuscript presented by the academy of management 2007 Annual Meeting, Philadelphia PA*, August 2007.

Belz, F.M.(2006). CH. 26. Marketing in the Age of Sustainable Development . *Copenhagen: Workshop of the Sustainable Consumption Research Exchange Network, Apr 20-21. (2006)*. pp. 299- 315.

Brown, J., Hendry, C.(2009). Public demonstration projects and field trials: Accelerating commercialization of sustainable technology in solar photovoltaics. *Energy Policy 37 (2009)*, pp. 2560–2573.

Bürer, M.J., Wüstenhagen, R. (2009). Which Renewable Energy Policy Is a Venture Capitalist's Best Friend? Empirical Evidence From a Survey Of International Cleantech Investors. *Energy Policy (2009),* doi:10.1016/j.enpol.2009.06.071.

Chang, P.L., Hsu,C.W., Lin, C.Y. Hsiung, C.M.(2011). Constructing a new business model for fermentative hydrogen production from wastewater treatment. *International Journal Of Hydrogen energy (2011).* 13914- 13921.

Charter, M. (2006). 22 Sustainable Consumption & Production, Business and Innovation. *Copenhagen: Workshop of the Sustainable Consumption Research Exchange Network, Apr 20-21. (2006)*. pp. 243- 252.

Charters, W.W.S.(2001). Developing markets for renewable energy Technologies. *Renewable Energy 22 (2001),* pp. 217- 222.

Chesbrough, H., Rosenbloom, R.S.(2002). The Role of the Business Model in Capturing Value from Innovation: Evidence from Xerox Corporation's Technology Spinoff Companies. *Industrial and Corporate Change, 11*(3), 529.

Chesbrough, H.(2010). Business Model Innovation: Opportunities and Barriers. *Long Range Planning (2009)*, doi:10.1016/j.lrp.2009.07.010.

CREG, 2012. 'De hoogte en de evolutie van de energieprijzen'. COMMISSIE VOOR DE REGULERING VAN DE ELEKTRICITEIT EN HET GAS. STUDIE (F)120131-CDC-1134. 31 januari 2012. *Creg rapport,* 2012.

Demil,D., Lecoc, X. (2010). Business Model Evolution: In Search of Dynamic Consistency. *Long Range Planning 43 (2010)*, pp. 227- 246.

Deygere, de, M., Gauderis, J., 2012. Rekenformules onrendabele top, toelichting onrendabel top model V2.0. PR105278.

DNV KEMA, 2012. Presentation DNV KEMA concerning the possible difficulties of the electricity in the future. December 2012.

Drury, E., Miller, M., Macal, C.M., Graziano, D.J., Heimiller, D., Ozik, J., Perry, T.D. (2012). The transformation of southern California's residential photovoltaics market through third-party ownership. *Energy Policy 42 (2012*), pp. 681–690.

Eckhardt, J.T., Shane, S.A., 2003. Opportunities and Entrepreneurship. *Journal of Management*, 2003 *29(3)*, pp. 333–349.

Enzensberger , N., Fichtner, w., Rentz, O.(2003). Financing renewable energy projects via closed-end funds-, a German case study. *Renewable Energy 28 (2003),* pp. 2023–2036.

Federale Overheidsdienst FINANCIEN, 2007. BTW van 6% voor de renovatie van woningen. Dienst Communicatie, D/2007 -1418/5.

Frantzis, L., Graham, S., Katofsky, R., Sawyer, H.(2008). *Photovoltaics Business Models. Subcontract Report February 2008*. NREL/SR-581-42304.

Gambardella, A., McGahan, A.M.(2010). Business-Model Innovation: General Purpose Technologies and their Implications for Industry Structure*. Long Range Planning 43 (2010),* pp. 262- 271.

Gunzel, F. & Wilker, H.(2009). Patterns in Business Models: a Case Survey*. Entrepreneurial Growth of the Firm November 19 - 20, 2009*. RENT XXIII 2009.

Huijben, J.C.C.M., Verbong,G.P.J., 2012. Breakthrough without subsidies? PV business model experiments in the Netherlands. *Energy Policy (2013),* http://dx.doi.org/10.1016/j.enpol.2012.12.073

Hamermesh, R.G., Marshall, P.W., Pirmohamed,T.(2002). Note on Business model analyses for the entrepreneur. *Harvard Business School, January 2002*. 9-802-048.

Hertwich, E.(2006). CH. 11. Towards a concrete sustainable consumption policy: What can we learn from examples? *Copenhagen: Workshop of the Sustainable Consumption Research Exchange Network, Apr 20-21. (2006)*. pp. 103-118.

Jagoda, K., Lonseth, R., Lonseth, A., Jackman, T.(2011). Development and commercialization of renewable energy technologies in Canada: An innovation system perspective. *Renewable Energy 36 (2011)*, pp. 1266- 1271.

Johnson, M.W., Christensen, C.M., Kagermann, H.(2008). Reinventing Your Business Model. *Harvard Business Review,* 12.

Laleman, R., 2009. Het LCA profile van zonnepanelen in Belgie. Masterverslag Academiejaar 2008-2009, Universiteit Gent.

Magretta, J.(2002). Why Business Models Matter. *Harvard Business Review, May 2002.* Reprint R0205F.

Malone, T.W., Weill, P., Lai, R.K., D'Urso, V.T., Herman, G., Apel, T.G., &Woerner, S.L.(2006). Do some Business models perform better than others? *Working Paper May 18, 2006.* pp. 4615-06.

Mason,K. &Spring, M.(2011). The Sites and Practices of Business Models. *Industrial Marketing Management 40 (2011)*, pp. 1032–1041.

McGrath, R.G.(2010). Business Models: A Discovery Driven Approach*. Long Range Planning 43 (2010),* pp. 247 – 261.

Morris, M., Schindehutte, M., Allen, J.(2005). The Entrepreneur's Business Model: Toward a Unified Perspective. *Journal of Business Research 58 (2005*) , pp. 726– 735.

Osterwalder, A., Pigneur, Y., & Tucci, C. L. (2005). Clarifying Business Models: Origins, Present, and Future of the Concept. *Communications of the Association for Information Systems, 16*.

Osterwalder, A., Pigneur, Y., (2010). Business Model Generation. This book was Self Published ISBN: 978-2-8399-0580-0.

Pacheco, D.F., Dean, T.J., Payne, D.S.(2010). Escaping the green prison: Entrepreneurship and the creation of opportunities for sustainable development*. Journal of Business Venturing 25 (2010)*, pp. 464–480.

Peter , R., Ramaseshan,B., Nayar, C.V.(2002). Conceptual model for marketing solar based technology to developing countries. *Renewable Energy 25 (2002*), pp. 511–524.

Pictoel, A., 2006. Marktrapport: De Vlaamse energie markt. Vreg, Vlaamse Regulering voor de Elektrciteits- en gas markt.

Pictoel, A., 2007. Marktrapport: De Vlaamse energie markt. Vreg, Vlaamse Regulering voor de Elektrciteits- en gas markt.

Pictoel, A., 2009. Marktrapport: De Vlaamse energie markt. Vreg, Vlaamse Regulering voor de Elektrciteits- en gas markt.

Pinkse, J., Van den Buuse, D.(2012). The development and commercialization of solar PV technology in the oil industry. Energy Policy 40 (2012), pp. 11–20.

Polfliet, A., 2012a. Kritische analyse van ondersteunmaatregelen inzake duurzame energie Vlaanderen en Nederland. Zero Emissions Solution bvba, Studie INTERREG ECO2PROFIT Ref. MSAP2012001.

Provance, M., Donnelly, R.G., Carayannis, E.G.(2011). Institutional influences on business model choice by new ventures in the microgenerated energy industry. *Energy Policy 39 (2011),* pp. 5630–5637.

Renko, M., Shrader, R.C., Simon, M.(2012). Perception of entrepreneurial opportunity: a general framework. *Management Decision Vol. 50 No. 7 (2012)*, pp. 1233-1251.

Sandén, B.A.(2005). The economic and institutional rationale of PV subsidies. *Solar Energy 78 (2005),* pp. 137–146.

Sauter, R., Watson, J.(2007). Strategies for the deployment of micro-generation: Implications for social acceptance. *Energy Policy 35 (2007)*, pp. 2770–2779.

Schoettl, J. & Lehmann-Ortega, L. (2010): Photovoltaic Business Models: Threat or Opportunity for Utilities?, *in: Wüstenhagen, R. & Wuebker, R. (Eds.): Handbook of Research on Energy Entrepreneurship.* Cheltenham: Edward Elgar Publishing Ltd.

Schleicher-Tappeser, R. (2012). How renewables will change electricity markets in the next five years. *Energy Policy (2012)*, http://dx.doi.org/10.1016/j.enpol.2012.04.042.

Schweizer, L., 2005. Concept and evaluation of business models. *Journal of General Management, 31 (2*), pp. 37-56.

Shum, K.L., Watanabe, C.(2010). Network externality perspective of feed-in-tariffs(FIT) instruments, Some observations and suggestions. *Energy Policy 38 (2010)* , 3266–3269.

Teece, D.J.(2005). Business Models, Business Strategy and Innovation. *Long Range Planning (2009)*, doi:10.1016/j.lrp.2009.07.003.

Tsoutsos, T.D.(2002). Marketing solar thermal technologies: strategies in Europe, experience in Greece. *Renewable Energy 26 (2002*), pp. 33–46.

VAE, 2009. Ontwerprapport 2009, OT/Bf berekeningen voor stakeholder overleg. Rapport VEA (ontwerp), 30 november 2012.

Vandaele, L., 2004. Bouwen met fotovoltaische zone-energie. Enschede-Van Muysewinkel, D/2004/3241/344.

Verbruggen, A., 2004. Tradable green certificates in Flanders (Belgium).Energy Policy 32 (2004) 165–176.

Vinc, S., 2008. De liberalisering van de europese electriciteitsmarkt: case België. Masterproef voorgedragen tot het bekomen van de graad van Master in de bedrijfseconomie. Universiteit Gent. Academiejaar 2007-2008.

Vreg, 2012. Mededeling van de Vlaamse Regulator van de Elektriciteits- en Gasmarkt, met betrekking tot de quotumberekening en indieningsprocedure. Vlaamse Regulator van de Elektriciteits- en Gasmarkt, Publiekrechtelijk vormgegeven extern verzelfstandigd agentschap. 1 November 2012.

Walsh, P.R.(2012). Innovation Nirvana or Innovation Wasteland? Identifying commercialization strategies for small and medium renewable energy enterprises. *Technovation 32 (2012),* pp. 32–42.

Wirtz, B.W., Schilke, O., Ullrich, S.(2010). Strategic Development of Business Models. *Long Range Planning (2010)*, doi:10.1016/j.lrp.2010.01.005.

Wüstenhagen, R., Boehnke, J. (2006). Chapter 23 Business models for sustainable energy. *Copenhagen: Workshop of the Sustainable Consumption Research Exchange Network, Apr 20-21. (2006)*. pp. 253- 258.

Wüstenhagen,R., Teppo, T.(2006). Do venture capitalists really invest in good industries? Risk-return perceptions and path dependence in the emerging European energy VC market. I*nternational Journal ofTechnology Management, Vol. 34(2006)*, Nos. 1/2.

Zott, C., Amit, R.(2008). The Fit Between Product Market Strategy and Business Model: Implications For Firm Performance. *Strategic Management Journal 29*: pp. 1–26.

Zott, C., Amit, R.(2010). Business Model Innovation; Creating Value In Times Of Change. *Working Paper WP-970*, July, 2010.

Online resources

- Airline-airco.be (2012); http://www.airline-airco.be/solarline/systemen2a.htm , accessed 21th of November 2012.

- Argusactueel.be (2013); http://www.argusactueel.be/binnenlands-nieuws/vlaamse-zonnepanelen-rendabel-zonder-subsidies, accessed 8th of January 2013.

- Auditconvenant.be (2013); www.auditconvenant.be, accessed 28th of February 2013.

- Benchmarking.be (2013); http://www.benchmarking.be/nl/voortgang_stand.asp, accessed 28th of February 2013.

- Bestuurszaken (2012); http://www.bestuurszaken.be/stroomschema/122 , accessed 16th of Oktober 2012.

- Board of Innovation (2012). www.theboardofinnovation.com , accessed on the 12th of march, 2012.

- Codex.vlaanderen.be (2012); http://codex.vlaanderen.be/Zoeken/Document.aspx?DID=1017331& param=inhoud, accessed 21th of November 2012.

- Comparemysolar.be (2012); http://www.comparemysolar.be/over-zonnepanelen/zonnehandleiding/ subsidies/ , accessed 11th of December 2012.

- Energiebesparen.be (2012); http://www.energiesparen.be/node/391, accessed 21th of November 2012.

- Epia.org (2012). http://www.epia.org/european-photovoltaic-industry-association.html, accessed on the 10th of July, 2012.

- Fiscus.fgov.be (2013); http://fiscus.fgov.be/interfaoifnl/Investeringsaftrek/Investeringsaftrek-2014.pdf , accessed 13th of March 2013.

- Golantec.be (2012); http://www.golantec.be/kostprijs%20diverse%20vormen%20van%20energie.htm , accessed 16th of Oktober 2012.

- Greenpowersystems.be (2012); http://www.greenpowersystems.be/index2.html , accessed 21th of 12 December 2012.

- Groeneleningen.be (2012); www.groeneleningen.be , accessed 27th of November 2012.

- Hln.be (2013); http://www.hln.be/hln/nl/943/Consument/article/detail/1469091/2012/07/12/Netbeheerders-kunnen-injectietarief-aanrekenen-voor-hernieuwbare-energie.dhtml, accessed 10th of January 2013.

- Jobfin.be (2012); http://www.jobfin.be/index.php?page=2 , accessed 27th of November 2012.

- Livios.be (2013); http://www.livios.be/nl/_build/_mone/_taxe/12907.asp, accessed 10th of January 2013

- Minfin.fgov.be (2012); http://www.minfin.fgov.be/portail2/nl/themes/dwelling/energysaving/green.htm , accessed 26th of November 2012.

- Ode.be (2012); http://www.ode.be/zonnestroom/wat-is-pv-vlaanderen , accessed 16th of Oktober 2012.

- Pvvlaanderen.be (2012); http://www.pvvlaanderen.be/zonnestroom/praktische-ids/steunmaatregelen, accessed 26th of November 2012.

- Ruimtelijkeordening.be (2012); http://www.ruimtelijkeordening.be/NL/Beleid/Vergunning/Vergunningnodig/Vergzonnepanelen/tabid/13937/Default.aspx , accessed 21th of November 2012.

- Seniorennet.be (2012); http://www.seniorennet.be/Dossier/Energie/energiemarkt.php , accessed 16th of Oktober 2012.

- Vlaanderen.be (2012); http://www2.vlaanderen.be/economie/energiesparen/milieuvriendelijke/monitoring_evaluatie/krachtlijnen_hervorming_steunmechanismen_juli2012.pdf, accessed 8th of November 2012.

- Vreg.be (2013); http://www.vreg.be/hoeveel-betaalt-pv-eigenaar-voor-gebruik-net, accessed 8th of January 2013.

- Vreg.be (2013); http://www.vreg.be/sites/default/files/adviezen/adv-2012-5.pdf, accessed 8th of January 2013.

- Zenrenewables.be (2012); http://www.zenrenewables.be/eindgebruikers/zen-renewables/zen-nieuws/milieuvergunningen-grote-pv-installaties/, accessed 26th of November 2012.

Interviews

Bertrand, C., 2013. Interview business models mapping with Bertrand at TU/e, Solar Access. Eindhoven, January 24th, 2013.

Damme, van, J., 2012. Telephonically Interview business models mapping with van Damme, Enfinity. At DNV KEMA, Arnhem. October 24th , 2012.

Hoedt, P., 2013. Interview business models mapping with Hoedt at Belfius bank. Brussel, February 4th, 2013.

Knapen, D., 2013. Telephonically Interview business models mapping with van Knapen, REScoop.be. At DNV KEMA, Arnhem. December 18th , 2012.

Lambrechts, H., 2012. Interview business models mapping with Lambrechts at DNV KEMA, Sun Projects. November 5th , 2012.

Polfliet, 2012b. Interview with chairman PV Vlaanderen to sketch the Flemish market. Aalst, October 18th , 2012.

Polfliet, 2012c. Telephonically Interview business models mapping with van Polfliet, Zero Emission Solutions. At DNV KEMA, Arnhem. January 15th, 2013.

Sannen, J., 2012. Interview business models mapping with Sannen at municipality Schoten, Intermix. October 18th , 2012.

Vansintjan, 2013. Presentatie in Amsterdam over Ecopower in het algemeen met additionele vragen. January 28th, 2013.

Verzyck, J., 2012. Interview business models mapping with Verzyck at municipality Schoten, Infrabel. October 18th, 2012.

Appendix 2 Theory

Appendix 2.1 The six generic business models

In appendix 2.1 the six generic business models of Schoettl & Lehman-Ortega (2010) are explained to provide an better insight in figure 10.

1. **Turnkey project provider**; within this business model the player is not the owner of the PV system. The organization only provides all the one-shot steps to the individual or commercial customer. This model is mostly mentioned for customer who don't want to get to much involved with the project and who don't want to act as general contractors in selecting and installing components. The required core competencies are the access to the market and the local project management.

2. **Build- own- operate rooftop PV**; in these models the player is the owner of the facility and is more the energy producer. The organization provides the customer with the complementary revenues and performs all steps for the customer. The core competences it this market need to be the access to the market as well as to finance ownership.

3. **Value- added service provider**; the player offers a value added service as consulting or project development. The organization is specialized in the one of the steps in the value chain or acts as an orchestrator but does not own the system.

4. **Construction and installation service provider**; the player offers a service with less added value than the third business model. The organization offers the construction and installation service to final customer or the orchestrator. Local project management is the main competency.

5. **Utility-scale power producer**; the player owns the large PV facility; the organization is an energy producer who had built the facility or acted as orchestrator. The main competence in this model is the ability to deal with large projects and to raise cash to finance them.

6. **Virtual power plant**; the player is a virtual operator who controls supply and demand so as to deal with peaks. The core competencies are information system management and trading skills.

Appendix 2.2 Explanation of the sixteen items of the board of innovation

16 blocks to visualize the business model

This is a short review of the explanation of the sixteen building blocks adopted from the board of innovation and is used as a tool to innovate business models (boardofinnovation.com, 2012).

Part I: Six players

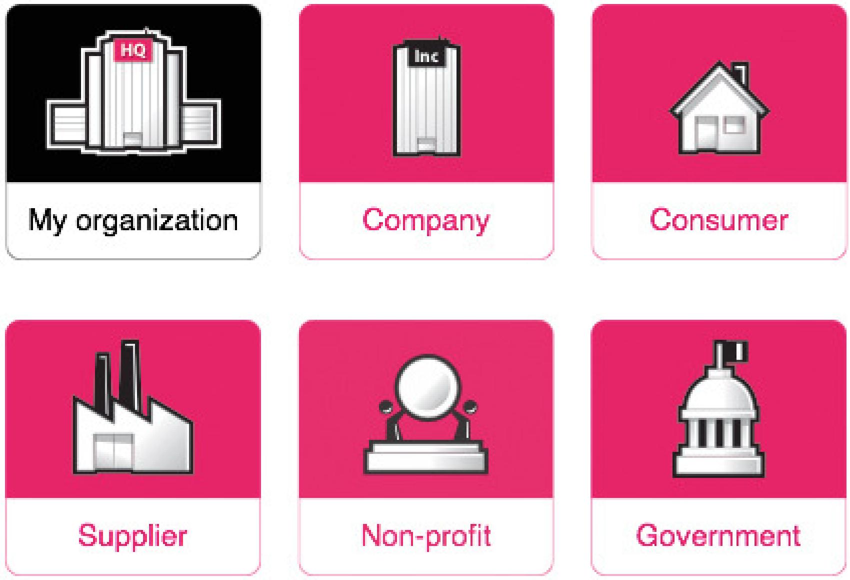


Figure 51 The Six Players (boardofinnovation.com, 2012)

A. Your organization

This is where your business model starts to get shape. Place this block in the center and build your model around it.

B. The company

The second most important block is the company. In most models this will be the actor that offers a product or service.

C. The consumer

The one that receives the product and gives something in return, is the consumer. In B2B models, the client is a company and will therefore be illustrated with the previous company icon. The general company-client relation is the same in both business systems.

D. Supplier

Although we prefer not to include much of the secondary stakeholders, sometimes it is relevant to show how the supplier side of a business system works. This icon can also be used for service suppliers like web or marketing agencies.

E. Non-profit

Unions or charity organizations are not focused on making money but often they do haven an impact on your organization. If relevant you can add this player to the system.

F. Government

Many companies do not like the involvement of a government on their business model, except when they have some money to offer.

Part II: Ten items to transfer

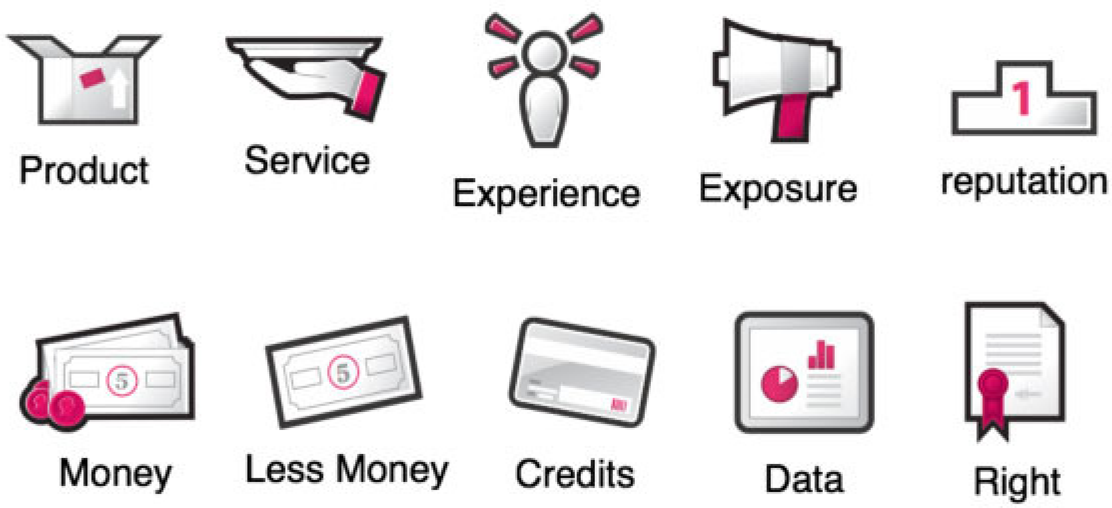


Figure 52 Ten Items to Transfer (boardofinnovation.com, 2012)

A. Product

The first, most straightforward offer to clients is an actual product, ranging from basic commodities up to finished goods. A BMW car is one example, but today also digital products can be included.

B. Service

A first way to upgrade your business model is to offer a service next to the product. BMW in this case will not only sell you a car, but will include maintenance and other services around the product. Of course, a lot of companies offer only services without product.

C. Experience

The two concepts of product and service are commonly applied throughout our economy. In the last years, several companies have moved a step further by offering an experience to customers. BMW does not sell a car with a service in this case, but a driving experience.

D. Reputation

Today, the next upgrade to reputation can only be found in a few sectors. In these cases, 'reputation' selling can be described as the most essential brand experience. If you take the example of BMW, then you could say that some people don't see their BMW as a driving experience but as the core values and reputation of the brand as such. Hereby, customers are able to shape their own identity with that of the company. Typically reputation will be placed in the top of Maslow's hierarchy of needs, which makes this type of transaction extremely valuable to companies.

E. Money

The typical currency that clients pay with, is money – which is critical to company's revenue models. This is in contrast to exchange. The building blocks make a differentiation between two types of money. This first icon represents the normal value of a good, including profit.

F. Less Money

This second icon represents money as well, but less than the normal amount covering cost and profit of what is offered. Usually this transaction implies that other revenue streams are added to the traditional business model.

G. Exposure/Attention

Active exposure or attention is the next step in the evolution of currency. People are not only offering their own attention, but also that of their peers in their social environment. For some businesses the spreading of their ideas and brand values becomes more important than the immediate return in money. Of course, companies can't just rely on active exposure, so their business model should include more players and other transactions. Many start-ups and even big web 2.0 companies are still struggling with this. There is a lot of exposure and value offered to clients, but there is no sustainable business model to capture that value in revenues and profit.

H. Credits

(Virtual) credit systems are on the rise. Therefore we have to add them to the business model blocks as well. Loyalty cards and similar are also covered.

I. Data

Information is one of the key items that's being transfered in modern business models. Depending on the context a mixture of 'information' related items (content, data, knowledge, articles,..) are being used in relation to this block.

J. Right

Ownership rights, IP and even the right to emit CO2 are items that stakeholders can exchange between each other. This must be the most abstract block but is necessary to illustrate the innovativeness of several models.

Appendix 2.3 The fourteen business models

Taken from: Schoettl, J. & Lehmann-Ortega, L. (2010).

For each possible combination, we consider what is offered (see row 5 in Appendix 8A1), who the customer might be (see row 6 in Appendix 8A1), and determine whether there is an economic rationale (see row 7 in Appendix 8A1), that is, a potential positive profit equation. If there is not, it is not a viable business model. Combining these elements leads us to a matrix that helps us identify 14 elementary, that is 'pure', business models for players wishing to be involved in the downstream PV market:

Integrated players

Two elementary business models are identified:

- *1.1 Build–own–operate rooftop PV model for commercial buildings offering a complementary revenue* The integrated player performs all the steps in the industry value chain. The value proposition is twofold: it sells the produced energy to energy buyers, but it first has to convince large building owners to rent their roofs to set up PV facilities. In return, the building owner will benefit from complementary revenue, without having to worry about the PV facility, which they do not own: they basically rent out the roof. The economic rationale for the player is to own several local facilities so as to sell the produced energy to an energy buyer.
- *1.2 Utility scale builder and operator* The integrated player performs all the steps in the industry value chain, and owns all the assets of the projects (both land and PV facility[8]). The sole customer is the energy buyer.

Orchestrator

Five elementary business models are identified:

- *2.3 Turnkey project provider for home owners also willing to own the facility* In this case, the player does not own the facility, it only provides the home owners with the full service of project development and/or construction and installation. The offer is one shot, which means that when the facility is built, the player is no longer involved in the facility. As an orchestrator, it performs some of these steps and outsources others, for example local construction that can be done by plumbers. The home owner then uses the produced energy or resells it to energy buyers.
- *2.4 Turnkey project provider for commercial building owner also willing to own the facility* This elementary business model is similar to the previous one; the only difference is the size of the project.
- *2.5 Builder, owner and operator of rooftop PV for commercial building owners providing a complementary revenue* In this elementary business model, the offer is similar to 1.1, but the player outsources some steps in the value chain (excluding operations and maintenance). Most players providing this offer are likely to use this business model rather than 1.1, since it has become rare for a player to be completely integrated.
- *2.6 Service provider to the owner of a large PV facility* This type of player provides a service to a large PV facility owner: it can either be project development or construction and installation or energy control, or a mix of these three steps.
- *2.7 Utility scale power builder orchestrator and producer* In this business model, the player basically is an energy producer that builds part of the facility and outsources the rest.

Layer player

Seven elementary business models are identified:

- *3.8. Small project development specialist* This player is specialized in helping home owners willing to install a PV facility. It can provide help in finding finance and in the paperwork.
- *3.9. Small facility construction and installation specialist* This player is specialized in constructing and installing small PV facilities. Plumbers are a good example of this type of player.
- *3.10. Medium-size project development specialist* This business model is similar to 3.8 but deals with larger projects for commercial sectors. The customer is the commercial owner him/herself or an orchestrator.
- *3.11. Medium-size project facility construction and installation specialist* This business model is similar to 3.9 but deals with larger projects for commercial sectors. The customer is the commercial owner him/herself or an orchestrator.
- *3.12. Large project development specialist* This business model is similar to 3.8 and 3.10, but deals with larger projects for ground-mounted PV facilities. The customer is the large facility owner him/herself or an orchestrator.
- *3.13. Large project facility construction and installation specialist* This business

156 *Handbook of research on energy entrepreneurship*

model is similar to 3.9 and 3.11, but deals with larger projects for ground-mounted PV facilities. The customer is the large facility owner him/herself or an orchestrator.

- *3.14. Virtual operator and energy controller* This player is specialized in energy control and is a virtual operator whose role is to control the distributed energy so as to flatten peaks. Such an operator becomes a market maker since it has access to information needed by all the other energy buyers in the market.

But these 14 elementary business models also present some similarities.

Identifying Generic Business Models

These 14 elementary business models are summarized in Appendix 8A2, which also presents the main key competencies required to perform these business models. If we group together those business models that present most similarities in terms of key competencies, six major strategic groups can be identified, which we shall call 'generic business models'. To make an analogy with the well-studied airline industry, Ryan Air and Easy Jet have the same generic business model (low cost) but have two distinct company business models (different choices of airport, different targeted customers).

- *Turnkey project provider: business models 2.3 and 2.4, for residential and commercial* In these business models, the player is not the owner of the facility. He/she only provides all the 'one-shot' steps to the individual or commercial customer. The main difference is the size of the project. This model provides a clear value to customers who do not want to become experts in PV and do not want to act as general contractors in selecting and installing components. According to Shaw (2000), customers purchasing micro-generation systems want three things: 'A competitive price per kWh – some customers may even pay a small premium if the system is environmentally benign or green; high reliability and immunity from long storm-related outages that are very painful, and seem to be happening more frequently; assurance of rapid-response service and competent maintenance support. In effect, they want an energy services solution: a plug-and-play, no hassle, don't-bother-me-with-the details solution' (p. 1). The required core competencies are access to the market, which is not concentrated, and local project management.
- *Build–own–operate rooftop PV: business models: 1.1 and 2.5* In these business models, the player is the owner of the facility: he/she is an energy producer. He/she provides the commercial customer with complementary revenue, and performs all steps for the customer (him/herself or through outsourcing). The required core competencies are access to the market, which is not concentrated, as well as access to cash to finance the ownership.
- *Value-added service provider: business models 2.6[9], 3.8, 3.10 and 3.12* The player offers a value-added service such as project development and consulting. He/she can be either specialized in one step in the value chain or act as an orchestrator, but he/she does not own the facility.
- *Construction and installation service provider: business models 2.6, 3.9, 3.11 and 3.13* The player offers a service with less added value than the previous generic

business model. He/she offers the construction and installation service to final customers or to orchestrators. The main competency is local project management.

- *Utility-scale power producer: business models 1.2 and 2.7* The player owns the large PV facility: he/she is an energy producer who has built the facility him/herself or acted as an orchestrator. Main competencies are ability to deal with large projects and to raise cash to finance them.
- *Virtual power plant: business model 3.14* The player is a virtual operator who controls supply and demand so as to deal with peaks. The core competencies are information system management and trading skills.

Figure 8.7 presents these different generic business models. It is important to note that these six generic business models are not exclusive: the same company could use several of the models at the same time.

Now that we have identified the six strategic groups, we can consider which of them would best suit utilities.

4 IDENTIFYING GENERIC PV BUSINESS MODELS BEST SUITED FOR UTILITIES

As stated in the introduction, PV is an opportunity that utilities need to seize. Indeed, as the cost of solar energy decreases, the growing number of companies that will probably enter the business of installing solar equipment could cut off some utilities from their customers. Furthermore, for many utilities, solar PV represents a distributed energy

Appendix 3 Interviews and transcriptions

Appendix 3.1 Interview schetsen markt Vlaanderen

Voorbereiding van het interview

Checklijst van zaken die aanwezig dienen te zijn bij afname van het interview;

- Vragenlijst in tweevoud
- Aantekeningen schrift
- Opname apparatuur(check batterij etc voor gebruik)

Alvorens het interview af te nemen dient er voldoende inzage in de situatie van de desbetreffende organisatie te zijn. De te bestuderen informatie kan worden achterhaald door gebruik te maken van websites, rapporten, krantenartikelen etc.

Voordat het daadwerkelijke interview begint is het wenselijk om een vertrouwelijke sfeer te creëren en de vertrouwelijkheid van het gesprek te waarborgen. Om dit te stimuleren zijn de volgende vragen wenselijk om mee te beginnen en te bespreken met de deelnemer;

- Doel van het interview:
  Met behulp van dit interview proberen wij een schets te kunnen maken van de verschillende partijen die er actief zijn in de Vlaamse PV markt. Het doel is om binnen de waardeketen te focussen op de organisaties die zich bezig houden met de toepassing van PV. De producerende bedrijven worden zodoende niet meegenomen. Binnen dit gedeelte van de waarde keten probeer ik alle verschillende soorten bedrijven mee te nemen om zodoende overzicht te kunnen creëren van de verschillende business modellen die er worden toegepast binnen deze sector. Een business model beschrijft de achterliggende gedachte hoe een organisatie met zijn product of service waarde creëert, levert en behoud (Osterwalder, 2010). Voor dit onderzoek zijn de ontwikkelingen die de business modellen hebben doorgemaakt in de afgelopen jaren van belang en met name de interactie met de veranderingen in wetgeving die in deze periode plaats hebben gevonden. Door deze ontwikkelingen in kaart te brengen proberen we het ontstaan van de enorme groeispurt in deze markt te kunnen achterhalen. Uw hulp zou het onderzoek een eind op weg kunnen helpen wanneer u mij zou kunnen helpen met het in kaart brengen van de verschillende organisaties actief binnen de Vlaamse markt.

- De verwachtte tijdsduur van dit interview bedraagt maximaal anderhalf uur.

- Alle informatie die gedurende dit interview aan het licht komt is vertrouwelijk en zal allen worden verwerkt wanneer u als organisatie daar toestemming voor geeft. Wanneer u de voorkeur geeft om sommige antwoorden op vragen niet te geven dan bent u hier ook absoluut niet toe verplicht. De uiteindelijke afstudeerscriptie en gepubliceerde artikelen worden openbaar gemaakt.

- Wanneer u toestemming verleend zal dit interview worden opgenomen. De geluidsopnames worden alleen intern gebruikt.

- Wanneer het interview is getranscribeerd zal de geïnterviewde een uitwerking toegestuurd krijgen zodat de desbetreffende persoon controle uit kan oefenen voor de daadwerkelijke publicatie.

Inleidend

1. Hoe bent u in aanraking gekomen met de PV sector en sinds wanneer bent u hierin actief?
2. Wat is uw rol over de jaren geweest in deze sector?
3. Met wat voor projecten bent u op dit moment zelf bezig en welke interessante projecten heeft u de afgelopen jaren gehad?
4. Hoe bent u betrokken geraakt bij PV Vlaanderen en wat is uw rol binnen deze organisatie?
5. Meer in het algemeen: wat is de rol van PV Vlaanderen?
6. Zijn er in België organisaties met soortgelijke doelstellingen?

Marktontwikkelingen sinds 2006

1. Hoe zou u de huidige situatie van de Vlaamse PV markt uit leggen mbt relevante wetgeving en uitvoeringsinstanties?
2. Hoe heeft dit zich ontwikkeld sinds 2006?
3. Wat zijn voor u de grootste veranderingen die plaats hebben gevonden in deze sector sinds 2006? Hoe zou u die verklaren?
4. Zijn er naar uw inziens veel bijzondere en innovatieve initiatieven geweest sinds 2006, kunt u enkele voorbeelden hiervan benoemen?
5. Hoe zou u het verschil in markt aandeel tussen Vlaanderen en de rest van Belgie verklaren?
6. Wat zijn de belangrijkste barrières voor PV in de Belgische markt op dit moment? Hoe zouden deze opgelost kunnen worden? Wat is uw eigen rol daarin?
7. Als we terugkijken: wat zijn de belangrijkste barrières sinds 2006 geweest? Zijn deze opgelost en zo ja, hoe is dit gebeurd?
8. Wat zijn voor u de belangrijkste spelers binnen de Vlaamse markt op dit moment? (commercieel, vrijwilligersorganisaties)
9. Welke minder invloedrijke spelers acht u toch van belang voor dit onderzoek?
10. Wat voor soort organisaties blijken het meest rendabel te zijn binnen deze markt of is het een breed scala aan organisaties die lijken te slagen?
11. Welke verklaring zou u hier voor geven?
12. Heeft u een verschuiving/verandering waargenomen in de type organisaties binnen de PV markt sinds 2006?
13. In figuur 1 zijn zes algemene business modellen weergegeven, welke organisaties herkent u hier uit de Vlaamse markt?

14. Zijn er naar uw inziens nog organisaties in de Vlaamse markt die in dit overzicht ontbreken, welke?
15. Waar zou u deze organisaties in dit diagram positioneren?

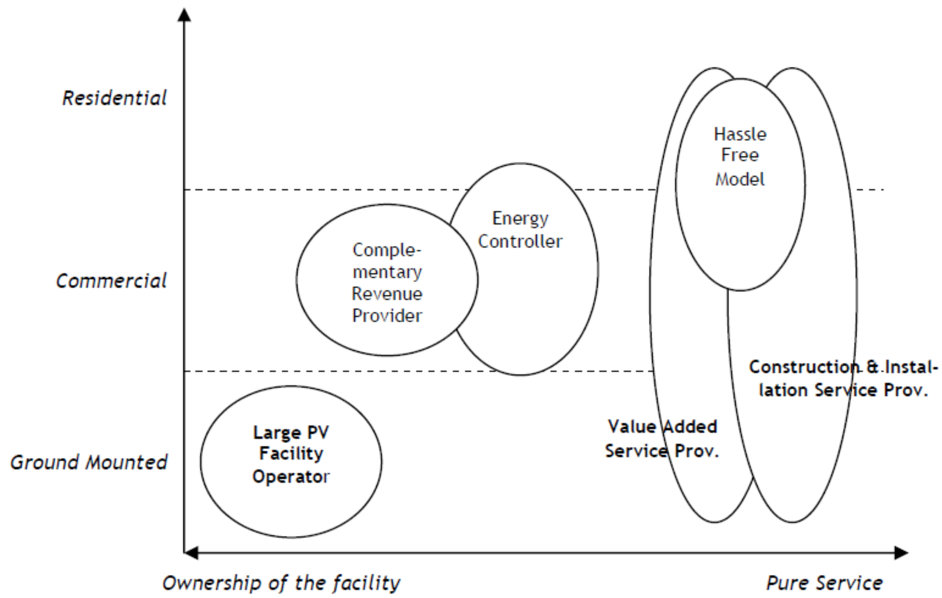


Figure 53 The Six Generic Business Models (Scoettle & Lehman-Ortega, 2011)

1. Op welke manier werken Belgische PV organisaties met elkaar samen? En met welk doel doen ze dit (e.g. lobbyen richting overheid, opzetten kwaliteitssystemen, kennisdeling, netwerken opbouwen)?
2. Wordt er ook samengewerkt met niet-PV gerelateerde partners? (e.g. zonne energie als onderdeel van bredere lokale duurzaamheids portfolio's).

Wetsveranderingen

3. Welke wetsveranderingen hebben sinds 2006 naar uw idee de meeste invloed uitgeoefend op de ontwikkeling van de markt?
4. Hoe zijn deze wetsveranderingen tot stand gekomen?
5. Denkt u dat er een link bestaat tussen de wetsveranderingen en het soort initiatieven dat in de markt wordt geïntroduceerd

Toekomstperspectief

6. Hoe ziet u de toekomst van PV in Vlaanderen?
7. Hoe ziet u de toekomst van uw eigen organisatie (PV Vlaanderen)?

Afsluitend

8. Ter afsluiting, heeft u nog interessante kennis die u met mij zou willen delen mbt de PV markt in Vlaanderen?
9. Zijn er nog andere zaken die u kan adviseren mee te nemen in dit onderzoek?
10. Heeft u wellicht nog ideeën over de manier hoe deze markt in kaart te brengen en waar te beginnen?
11. Op welke manier denkt u dat we de meeste kans maken om geen interessante organisaties over het hoofd te zien? En heeft u misschien nog bepaalde ideeën over initiatieven die absoluut niet mogen ontbreken in dit onderzoek?
12. Zijn er nog zaken die u graag besproken zou zien?

Heel erg bedankt voor uw tijd en uw interesse in dit onderzoek. We proberen de uitkomst van dit onderzoek zo snel als mogelijk te transcriberen en vervolgens naar uw toe te sturen. Mocht u nog op of aanmerkingen hebben op de uitkomst dan bent u hier natuurlijk vrij in. Wanneer er zaken zijn die niet besproken zijn tijdens dit interview die u later te binnen schieten schroom dan niet contact met ons op te nemen. Nogmaals hartelijk dank voor uw behulpzaamheid en we zullen u de uitkomst van het onderzoek eind Februari toezenden.

Matthijs van Rijn
mlbvanrijn@gmail.com
telnr.: 00316- 14033680

Boukje Huijben
J.C.C.M.Huijben@tue.nl
telnr.: 00316- 40869001

Appendix 3.2 Interview in kaart brengen Business Modellen Vlaanderen

Voorbereiding van het interview

Checklijst van zaken die aanwezig dienen te zijn bij afname van het interview;

- Vragenlijst in tweevoud
- Aantekeningen schrift
- Opname apparatuur(check batterij etc voor gebruik)

Alvorens het interview af te nemen dient er voldoende inzage in de situatie van de desbetreffende organisatie te zijn. De te bestuderen informatie kan worden achterhaald door gebruik te maken van websites, rapporten, krantenartikelen etc.

Voordat het daadwerkelijke interview begint is het wenselijk om een vertrouwelijke sfeer te creëren en de vertrouwelijkheid van het gesprek te waarborgen. Om dit te stimuleren zijn de volgende vragen wenselijk om mee te beginnen en te bespreken met de deelnemer;

- Doel van het interview:
  Met behulp van dit interview proberen wij een beeld te schetsen van de toegepaste business modellen voor de commercialisering van PV in Vlaanderen. Er wordt zo goed als mogelijk geprobeerd om alle toegepaste business modellen binnen deze markt zo nauwkeurig mogelijk in kaart te brengen. Voor dit onderzoek zijn de ontwikkelingen die de business modellen hebben doorgemaakt in de afgelopen jaren van belang en met name de interactie met de veranderingen in wetgeving die in deze periode plaats hebben gevonden. Door deze ontwikkelingen in kaart te brengen proberen we het ontstaan van de enorme groeispurt in deze markt te kunnen achterhalen. Wellicht zijn niet alle vragen van dit interview op uw organisatie van toepassing, dit komt omdat er een algemene vragenlijst in samengesteld om achteraf de verschillende antwoorden beter te kunnen vergelijken.

- De verwachtte tijdsduur van dit interview bedraagt maximaal anderhalf uur.

- Alle informatie die gedurende dit interview aan het licht komt is vertrouwelijk en zal alleen worden verwerkt wanneer u als organisatie daar toestemming voor geeft. Wanneer u de voorkeur geeft om sommige antwoorden op vragen niet te geven dan bent u hier ook absoluut niet toe verplicht. De uiteindelijke afstudeerscriptie en gepubliceerde artikelen worden openbaar gemaakt.

- Wanneer u toestemming verleend zal ook dit interview worden opgenomen in deze algemeen toegankelijke documenten. De geluidsopnames worden alleen intern gebruikt voor de optimalisering van de bruikbaarheid van dit interview.

- Wanneer het interview is getranscribeerd zal de geïnterviewde een uitwerking toegestuurd krijgen zodat de desbetreffende persoon controle uit kan oefenen voor de daadwerkelijke publicatie.

Het interview is opgebouwd uit de volgende hoofd delen;

1. Algemene informatie over het initiatief
2. Business model gerelateerde vragen, om uw business model te kunnen schetsen
3. Veranderingen binnen uw business model en externe invloeden
4. Lering en aanpassingen
5. Resultaat gerichte vragen om inzicht te creëren in de impact die bepaalde ontwikkelingen hebben gehad op uw organisatie
6. Toekomst perspectief

De vragenlijst

Algemene informatie over het initiatief

1. Wanneer bent u begonnen met het initiatief?
2. Wat was de motivatie om te starten met dit initiatief, is dit veranderd over de tijd?
3. Wat was uw oorspronkelijke doel, is dit in de loop van de tijd bijgesteld en waarom?((SNM: Expectations b.v. X projecten, panelen, woningen in een bepaald tijdsbestek)
4. Wat voor rechtsvorm heeft u initiatief? (bijv. stichting, corporatie, B.V.)
5. In welke regio bent u actief en is daar een specifieke reden voor?
6. Bent u ook bezig met andere technologieën en waarom?
7. Bestaat uw organisatie uit een of meerdere bedrijven, worden er diensten of onderdelen geleverd/ geproduceerd door dochter ondernemingen? (B. De Organisatie)
8. Waar kan uw organisatie worden gepositioneerd binnen de waarde keten van de PV? (A. Uw Organisatie)

Business model gerelateerde vragen;

<u>The Board of Innovation</u>

De tien items van uitwisseling;

1. Verkoopt uw organisatie de PV systemen als product? (Product)
2. Levert uw organisatie installatie/ onderhoud/ after sales/ recycling service? (Service)
3. Verstrekt uw organisatie informatie/vervult u een adviserende rol? (Ervaring)
4. Wordt de reputatie van uw organisatie gebruikt als core value voor het verstrekken van het product/service? (Reputatie)

5. Op welke manier ontvangt u compensatie voor de door u geleverde diensten/producten? (money) Is dit in de vorm van een financiële tegemoetkoming? (Money) *(aanvullende vragen 35&36 Revenue Streams)* (C. De Consument)
6. Ontvangt uw organisatie een financiële tegemoetkoming van andere partijen dan uw klanten, welke zijn dit en waarom? (Less money)
7. Is uw product gebruikt om indirecte inkomsten te genereren? Bijvoorbeeld door gebruikt te maken van adverteren via de door u gebruikte kanalen zoals uw website etc.? (Exposure/ attention)
8. Ontvangt u support voor het leveren van uw product/dienst? Bijvoorbeeld de vorm van greencertificates of andere te ontvangen credits? (Credits)
9. Maakt uw organisatie gebruik van de aanvullende data(gegevens) om uw product/dienst te leveren?(Data)
10. Maakt u gebruik van de uitwisseling van rechten met de levering van uw product/dienst? Zijn er bijvoorbeeld rechten uitgeleend of verpacht om PV toestellen op gehuurd grond/ dak te plaatsen? (Rechten*)*

❖ *Waarde Propositie (Value Proposition)*

9. Welk probleem probeert u voor de klant op te lossen met uw product/service?
10. Wat biedt uw organisatie aan voor haar klanten/ deelnemers?
11. Welke voordelen bestaan er voor de klant wanneer ze gebruik maken van uw product/service?
12. Welke extra waarde biedt uw product/service voor de klanten ten opzichte van concurrenten?

❖ *Klanten segmenten (Customer Segments)*

(beschrijf voor elke klant(-en groep) de kenmerken als leeftijd, inkomen, opleidingsniveau voor particulieren en omzet, FTE's etc voor B2B)

13. Voor wat voor soort klant (-en groep) is uw product/dienst bedoeld? (C. De Consument)
14. Welke soort klant (-en groep) blijkt u te bedienen met uw product/dienst, en wanneer dit afwijkt van de doelgroep; hoe is deze afwijking ontstaan? (C. De Consument)

❖ *Kern activiteiten (Key Activities)*

15. Welke kern activiteiten zijn er vereist om uw waarde propositie te realiseren?
16. Welke werkzaamheden worden er verricht door uw organisatie en hoe verhouden deze zich tot elkaar?
17. Aan welke werkzaamheden bent u in verhouding het meeste tijd kwijt?
18. Welke producten/diensten worden er uitbesteed door uw organisatie? (C. De Consument)
19. Wie is of zijn eind verantwoordelijk voor de geleverde werkzaamheden?

❖ *Klanten relaties & Distributie Kanalen ((Customer Relationships & Channels)*

20. Wat voor relaties onderhoudt u met uw verschillende klanten en hoe is deze relatievorm tot stand gekomen?

21. Welke frequentie heeft het onderhoudt van de relatie en over welk tijdsbestek wordt deze relatie onderhouden?
22. Op welke manier kunnen potentiële klanten in contact komen met uw organisatie en hoe benaderd u potentiële klanten?
23. Welke kanalen blijken het meest effectief om de klanten te bereiken en hoe verhouden de kosten zich hiertoe? (bijvoorbeeld online bestellen is goedkoop maar weinig effectief)
24. Waarom heeft uw organisatie gekozen voor juist deze vormen?
25. Op welke manier worden ze geholpen bij hun keuze voor producten/diensten van uw organisatie?
26. Hoe wordt uw product/dienst geleverd aan de klant?
27. Heeft de klant zeggenschap binnen uw organisatie?

❖ *Belangrijkste middelen (Key Resources)*

28. Welke middelen zijn er noodzakelijk om uw waarde propositie te waarborgen?
29. Hoe verhouden deze zich tot de middelen die uw organisatie tot zijn eigen beschikking heeft?

❖ *Kosten structuren (Cost structures)*

30. Welke kosten worden er binnen uw organisatie gemaakt?
31. Welke kern activiteiten/middelen zijn de grootste kostenposten binnen uw organisatie?
32. Hoe heeft u uw prioriteiten gesteld omtrent uw uitgavenpatroon?

❖ *Inkomsten stroom (Revenue Streams)*

Ter aanvulling van de tien items van uitwisseling, wellicht al naar voren gekomen in die vragen.

33. In hoeverre worden uw kosten gedekt door directe compensatie vanuit de klant en welk percentage wordt gedekt door (in-) directe subsidieregelingen? (Money)
34. Welke subsidieregelingen kan u als organisatie aanspreken en welke spreekt u daadwerkelijk aan? Vanwaar uw keuzes voor deze regelingen? (Money)

❖ *Kern partners (Key Partners)*

35. Wat zijn de belangrijkste project partners waar u mee samenwerkt en wat is hun rol in de verwezenlijking van uw waarde propositie?
36. Welke partijen zijn nog meer van invloed op de levering van uw product/service die niet uw directe project partners zijn en wat levert deze samenwerking voor u op?(denk aan branche organisaties, netwerkclubs e.d.)
37. Wordt uw organisatie beïnvloed door de activiteiten van een non-profit organisatie, op welke manier? (E. Non-Profit)

Business Model veranderingen

We hebben zojuist het business model van uw organisatie in kaart gebracht.

1. Heeft u het idee dat u hier veranderingen in aan heeft gebracht sinds 2006?
2. Wat waren de drijvende factoren voor deze aanpassingen aan uw model?
3. Hoe hebben deze veranderingen voor uw organisatie uitgepakt?

F. Overheid (inzoomen op relatie business modellen en institutionele omgeving: opportunity creation en opportunity discovery)

4. Op welke manier is the commercialisering van uw product/dienst beïnvloed door de overheid?
5. Zijn de verstrekkingen van subsidies e.d. belangrijk om uw business case rond te krijgen?
6. Is uw business model, of andere onderdelen van uw organisatie, beïnvloed door wetsveranderingen die de afgelopen zes jaar zijn doorgevoerd, en op welke manier heeft u op deze veranderingen ingespeeld?
7. Hoe zijn deze wetsveranderingen tot stand gekomen?
8. Heeft u geprobeerd om op voorhand in te spelen op de wetsveranderingen die komende waren om zodoende wellicht uw voordeel hieruit te halen of heeft u noodgedwongen aanpassingen moeten maken?
9. Heeft uw organisatie geprobeerd om wetsveranderingen te beïnvloeden de afgelopen zes jaar en op welke manier heeft u dit geprobeerd te bewerkstelligen?
10. Wat zou er aan het huidige beleid moeten veranderen? Hoe zou dit moeten gebeuren en wat is uw eigen rol hierin?

Learning and adaptation (SNM niche internal process)

11. Wat is het meest meegevallen bij het opzetten en draaiend houden van de organisatie?
12. Wat zijn de belangrijkste problemen die u tot nu toe bent tegengekomen? Heeft u deze problemen kunnen oplossen? En zo ja, hoe heeft u dit gedaan?
13. Welke problemen heeft u niet kunnen oplossen? En wat is er nodig om deze in de toekomst wel op te kunnen lossen? (samenwerking tussen partijen om bijvoorbeeld wetsveranderingen door te voeren of kwaliteitscontrole systemen op te bouwen).
14. Deelt u deze lessen met andere partijen? En zo ja, met welke partijen en op welke manier? Zo nee, zou u in de toekomst bereid zijn om dit wel te doen? Op welke manier zou u dit willen doen? (learning between projects, b.v. via brancheorganisaties of presentaties op conferenties, ook: opbouwen van de benodigde netwerken)

Bedrijfsresultaten sinds 2006

15. Hoeveel FTE’s heeft u de afgelopen zes jaar gehad en hoe zijn deze geëvolueerd?
16. Hoe heeft uw omzet zich ontwikkeld over de afgelopen zes jaar?
17. Hoe heeft uw uitgavenpatroon zich ontwikkeld over zes jaar?

18. Hoe zou u deze ontwikkelingen verklaren?

Toekomst perspectief

Toekomst van de organisatie

19. Hoe ziet u de toekomst van uw organisatie?
20. Wilt u deze in de toekomst uitbreiden? Op welke manier? (e.g. nieuwe klantsegmenten, links met andere (niet-PV) projecten)
21. Wat zijn daarbij de grootste belemmeringen? En hoe zouden deze opgelost kunnen worden?

Toekomst van de Belgische markt

22. Hoe ziet u de toekomst van de Belgische PV markt?
23. Hoe kan uw organisatie hierop inspelen?
24. Zijn er nog zaken die u graag besproken zou zien?
25. Heeft u misschien nog bepaalde ideeën over initiatieven die niet mogen ontbreken in dit onderzoek?

Heel erg bedankt voor uw tijd en uw interesse in dit onderzoek. We proberen de uitkomst van dit onderzoek zo snel als mogelijk te transcriberen en vervolgens naar u toe te sturen. Mocht u nog op of aanmerkingen hebben op de uitkomst dan bent u hier natuurlijk vrij in. Wanneer er zaken zijn die niet besproken zijn tijdens dit interview die u later te binnen schieten schroom dan niet contact met ons op te nemen. Nogmaals hartelijk dank voor uw behulpzaamheid en we zullen u de uitkomst van het onderzoek eind Februari toezenden.

Matthijs van Rijn
mlbvanrijn@gmail.com
telnr.; 00316- 14033680

Boukje Huijben
J.C.C.M.Huijben@tue.nl
telnr.; 00316- 40869001

Appendix 4 Actors in the market

Appendix 4.1 Explanation Distribution and Transmission system operators

4.1.1 Distribution system operator

Taken from: http://www.vreg.be/sites/default/files/rapporten/rapp-2007-2.pdf

In het decreet van 19 mei 2006 houdende diverse bepalingen inzake leefmilieu en energie (Belgisch Staatsblad 20 juni 2006) werden een aantal artikelen opgenomen die wijzigingen aan het Elektriciteits- en Aardgasdecreet aanbrengen. Zo werd gepreciseerd welke activiteiten netbeheerders nog mogen ondernemen op het gebied van de productie en levering van elektriciteit en aardgas. Er werd onder andere bepaald dat een netbeheerder voortaan geen activiteiten met betrekking tot de productie van elektriciteit meer mag uitvoeren. Wel mag hij nog elektriciteit uit hernieuwbare energiebronnen produceren, evenals kwalitatieve warmtekrachtkoppelingsinstallaties uitbaten waarvan hij op 1 oktober 2006 eigenaar was, op voorwaarde dat hij de opgewekte elektriciteit enkel gebruikt om het eigen verbruik van de netbeheerder en/of zijn netverliezen te dekken.. Wat de levering van elektriciteit en aardgas betreft, wordt nu uitdrukkelijk bepaald dat de netbeheerder enkel leveringsactiviteiten mag ondernemen in het kader van de uitvoering van openbaredienstverplichtingen. Verder wordt bepaald dat aan de netbeheerders de openbaredienstverplichting kan worden opgelegd om elektriciteit en aardgas te leveren aan afnemers die niet meer over een geldig leveringscontract beschikken.

Het Vlaams Parlement keurde op 13 december 2006 het voorstel van decreet goed waarmee het Aardgasdecreet van 6 juli 2001 werd gewijzigd en de dekkingsgraad van het aardgasdistributienetwerk werd uitgebreid (Belgisch Staatsblad 9 maart 2007). In dat decreet wordt bepaald dat de netbeheerder maximaal 250 euro mag aanrekenen voor de aansluiting van een “aansluitbaar gebouw” op het aardgasnet, op voorwaarde dat het om een normale huishoudelijke aansluiting gaat en er niet meer dan 20 meter leiding moet worden aangelegd. Een “aansluitbaar gebouw” is ofwel een gebouw dat in een woongebied of woonuitbreidingsgebied ligt en waarbij er een aardgasleiding langs de kant van de weg en ter hoogte van het gebouw is voorzien, ofwel een gebouw dat buiten een woongebied ligt, maar waar er wel een aardgasleiding ter hoogte van het gebouw (al dan niet aan de andere kant van de weg) is voorzien. De aardgasnetbeheerder mag beslissen om in woongebieden toch een gebouw op het aard gasnet aan te sluiten wanneer er geen aardgasleiding aan de kant van de weg van de woning ligt. In dat geval zullen de kosten van de onderboring niet aan de afnemer worden doorgerekend. Ten slotte werd aan de aardgasnetbeheerders de openbaredienstverplichting opgelegd om in hun leveringsgebied te zorgen voor een aansluitbaarheidsgraad in woongebieden en woonuitbreidingsgebieden van minstens 95 % in 2015 en 99 % in 2020 (met uitzondering van woongebieden met landelijk karakter).
De aardgasnetbeheerders moeten daarover jaarlijks aan de VREG rapporteren aan de hand van een investeringsplan, dat door de VREG moet worden goedgekeurd. Op het vlak van de sociale openbaredienstverplichtingen die aan de netbeheerders zijn opgelegd, werden een aantal wijzigingen aangebracht via het besluit van de Vlaamse Regering van 22 december 2006 (Belgisch Staatsblad 31

januari 2007). Voorheen werden alle huishoudelijke afnemers van wie het leveringscontract door de leverancier was opgezegd, via een budgetmeter verder van elektriciteit voorzien door de netbeheerder. Nu moet de netbeheerder die afnemer op vol vermogen beleveren en pas een budgetmeter plaatsen bij een afnemer die zijn facturen aan de netbeheerder niet betaalt. Verder wordt een budgetmeter nu ook bij niet-beschermde afnemers gratis geplaatst. De minimale levering van elektriciteit via een budgetmeter of stroombegrenzer werd opgetrokken van 6 naar 10 ampère. Bij al geplaatste budgetmeters wordt dat bij de eerstvolgende oplading van de budgetmeterkaart aangepast. Bij de geplaatste stroombegrenzers moet de netbeheerder dat bij zijn eerstvolgende bezoek aan de betrokken afnemer aanpassen. Dat moet vóór 31 december 2007 gebeuren. Ten slotte mag de netbeheerder in de periode van 1 december tot 31 maat niet langer afsluiten. Die periode kan bij aanhoudende vorst eventueel nog door de minister worden verlengd.

Appendix 4.1.2 Distribution and Transmission grid

Taken from: http://www.creg.info/pdf/Studies/F1134NL.pdf (p.38)(CREG, 2012)

Transmission

84. Op 11 januari 2012 werd de Wet 44 tot wijziging van de wet van 29 april 1999 betreffende de organisatie van de elektriciteitsmarkt en de wet van 12 april 1965 betreffende het vervoer van gasachtige produkten en andere door middel van leidingen in het Belgisch Staatsblad gepubliceerd.

85. De **begrippen transmissie en transmissienet** worden door deze wet als volgt gedefinieerd:

“6° **transmissie**: transmissie van elektriciteit langs het gekoppeld extra hoogspannings- en hoogspanningsnet, met het oog op de belevering van eindafnemers of distributienetbeheerders, de levering zelf niet inbegrepen;

7° **transmissienet**: het nationaal gekoppeld extra hoogspannings- en hoogspanningsnet voor elektriciteit dat, met het oog op de belevering van eindafnemers of distributienetbeheerders, de levering zelf niet inbegrepen, de bovengrondse lijnen, ondergrondse kabels en installaties omvat die dienen voor de transmissie van elektriciteit van land tot land die door een interconnector verbonden zijn, de transmissie van elektriciteit uitgewisseld door de producenten, de eindegebruikers en de distributienetbeheerders die in België zijn gevestigd en voor de transmissie van elektriciteit uitgewisseld op het net dat gelegen is in de zeegebieden waarover België zijn jurisdictie kan uitoefenen, evenals voor de interconnector tussen elektriciteitscentrales en tussen elektriciteitsnetten.”

86. Artikel 12, §1 van de elektriciteitswet stelt dat de aansluiting, het gebruik van de infrastructuren en van de elektrische systemen en, desgevallend, de ondersteunende diensten van de netbeheerder het voorwerp uitmaken van tarieven voor het beheer van het transmissienet en de netten die een transmissiefunctie hebben. Met het begrip net met een transmissiefunctie wordt enerzijds het transmissienet bedoeld en anderzijds de distributienetten of de lokale of regionale transmissienetten

met een spanningsniveau tussen 30kV en 70kV die hoofdzakelijk dienen voor het vervoer van elektriciteit voor niethuishoudelijke afnemers en andere netten in België alsook de wisselwerking tussen installaties voor productie van elektriciteit en tussen elektrische netten met een transmissiefunctie.
87. Meestal wordt 'transmissie' slechts gehanteerd voor netten met een nominale
spanning vanaf 220 kV en hoger. Soms wordt ook het spanningsniveau van 150 kV inbegrepen. In de regel zijn de netten met een spanning onder 150 kV niet inbegrepen (eerder distributie).

89. Het regeerakkoord van 1 december 2011 voorziet weliswaar de overheveling naar de Gewesten van de bevoegdheid voor de distributienettarieven, maar niet de tarieven van de netwerken die een transportfunctie hebben, zelfs indien ze een nominale spanning gelijk aan of lager dan 70 kV hebben. De CREG is en blijft tarifair bevoegd voor de netten met een transmissiefunctie.

90. NV Elia System Operator ('Elia') is zowel de federaal aangestelde beheerder van het nationale transmissienet als deze aangesteld door de 3 gewesten voor de netten voor lokaal of gewestelijk transport in de Gewesten (30-70kV). Tarifair dient Elia dus één tariefvoorstel in met de nettarieven voor 'de netten met een transmissiefunctie'.

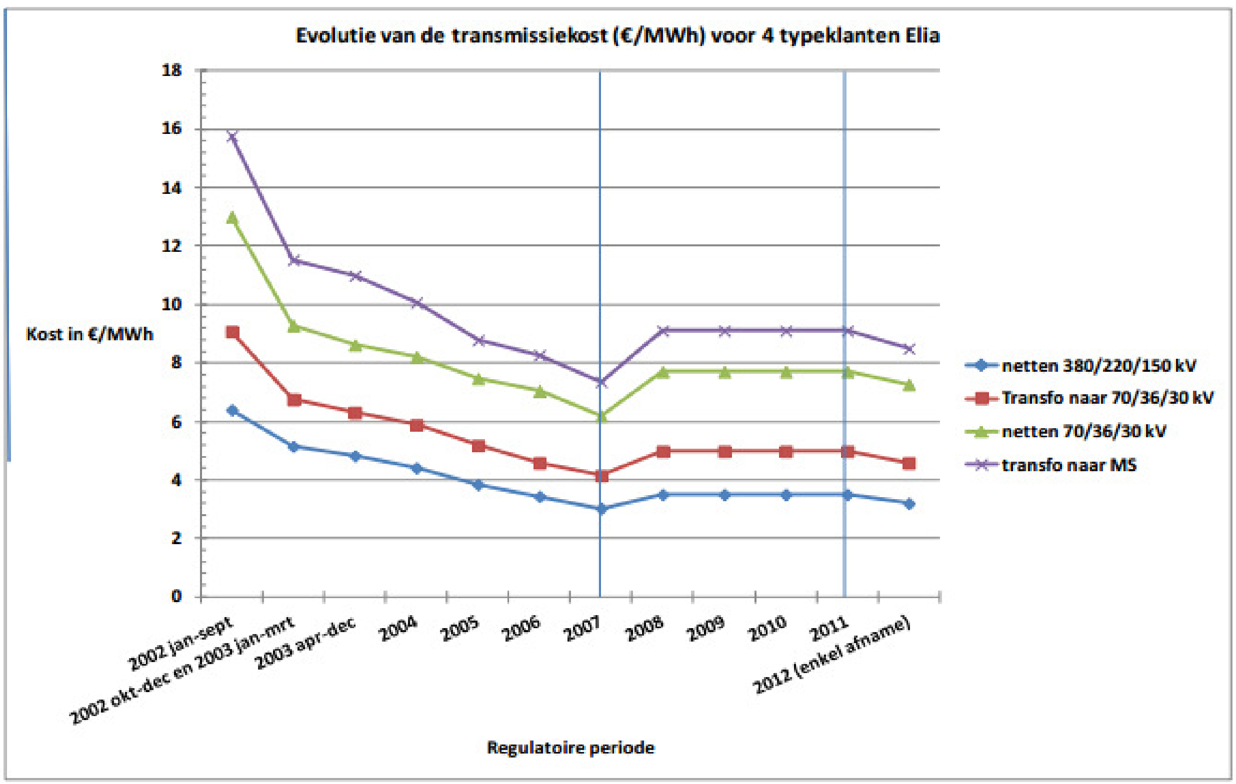


Figure 54 Evolutie tarieven Elia (Bron; CREG, 2012)

Meerjarentarieven 2012-2015
100. Op 22 december 2011 heeft de CREG het aangepast tariefvoorstel van Elia Goedgekeurd en zo de transmissienettarieven voor de regulatoire periode 2012-2015 vastgelegd. Het traject daartoe was niet

vanzelfsprekend, noch op gebied van het wettelijk kader en de tarifaire methodologie, noch op gebied van de vastlegging van het totaal inkomen en de nettarieven.

Distributie

Algemene bepalingen
108. De begrippen distibutie en distributienet worden door de wet als volgt gedefinieerd:
"10° **Distributie:** de transmissie van elektriciteit langs hoog-, midden- en laagspanningsdistributienetten met het oog op de levering aan afnemers, de levering zelf niet inbegrepen;

12° **Distributienet**: elk net dat werkt aan een spanning die gelijk is aan of lager is dan 70 kilovolt, voor het vervoer van elektriciteit naar afnemers op regionaal of lokaal niveau."

109. In tegenstelling tot wat geldt voor het transmissienet zijn er op het distributieniveau Verschillende netbeheerders (DNB's). Voor het Vlaams Gewest onderscheiden we AGEM, DNB BRUSSELS AIRPORT, GASELWEST, IMEA, IMEWO, INTER-ENERGA, INTERGEM, INTERMOSANE, IVEG, IVEKA, IVERLEK, PBE, SIBELGAS-NOORD en INFRAX WEST. Voor het Waals Gewest gaat het over AIEG, AIESH, GASELWEST, IDEG, IEH, INTEREST, INTERLUX, INTERMOSANE, PBE, SEDILEC, SIMOGEL, TECTEO-RESA, REGIE DE WAVRE. Ten slotte voor het Brussels Hoofdstedelijk Gewest betreft het SIBELGA.

110. Net zoals Elia (als beheerder van het transmissienet) dienen ook de DNB's een tariefvoorstel, ter goedkeuring, in bij de CREG. Dit kan op het eerste zicht verrassend klinken aangezien de gewesten bevoegd zijn voor onder andere de distributie en het plaatselijk vervoer van elektriciteit via netten met een nominale spanning lager of gelijk aan 70kV. Daarenboven dienen de DNB's in hun tarieven rekening te houden met de (financiële) impact van gewestelijke regelgeving zoals bijvoorbeeld kosten van openbare dienstverplichtingen (ODV's) en investeringsprogramma's.

112. Net zoals voor Elia het geval is, dienen de DNB's een tariefvoorstel in voor meerdere jaren, voor het eerst van toepassing vanaf 1 januari 2009. De periode loopt over vier jaar, dus van 2009 tot 2012. De goedkeuring van de tariefvoorstellen van de verschillende DNB's heeft heel wat voeten in de aarde (gehad).

113. Aangezien er tussen de gewesten verschillen kunnen worden vastgesteld betreffende energiebeleid en de gevolgen hiervan voor de DNB's (vb.: ODV's), is het, in het kader van deze studie, aangewezen om eventuele regionale verschillen tot uiting te laten komen. Om die reden worden in de verdere analyse steeds cijfers getoond van drie DNB's uit elk gewest één. Er wordt gekozen voor de DNB's die het grootste volume in hun gewestdistribueren:
- Vlaanderen: Imewo;
- Wallonië: IEH;
- Brussel: Sibelga.

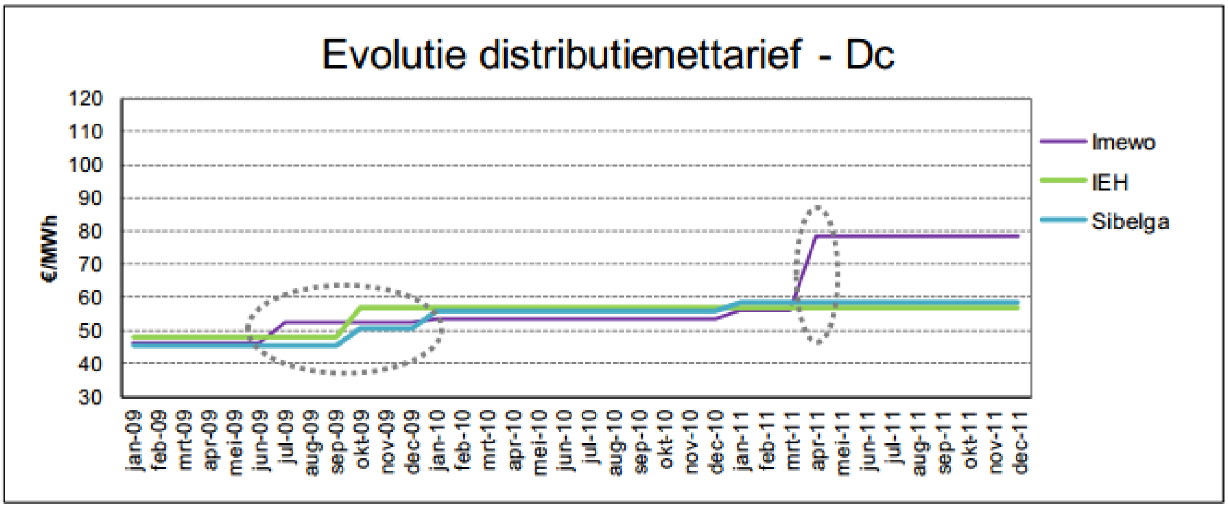


Figure 55 Overzicht evolutie distributienettarief (Bron; CREG, 2012)

118. Deze stijging van tarieven vond vooral zijn oorsprong in het regulator kader van de meerjarentarieven zoals vervat in het Koninklijk Besluit van 2 september 2008. Als belangrijkste oorzaken van deze stijgingen wordt vooral verwezen naar:

- de hogere billijke vergoeding door de aanpassing van de verhouding Eigen Vermogen/Gereguleerde activabasis in plaats van Eigen Vermogen/Totaal Vermogen;
- de automatische indexering van de gebudgetteerde kosten 2008 in plaats van de laatste gekende werkelijke kosten;
- de afschrijvingen op meerwaarden (toegestaan door het Hof van Beroep);
- de productiviteitsstijging kleiner dan inflatie over 4 jaar + basis voor berekening productiviteitsstijging zijn enkel een beperkt aantal beheersbare kosten.

	IMEWO			SIBELGA			IEH		
	werkelijkheid 2009	werkelijkheid 2010	budget 2011	werkelijkheid 2009	werkelijkheid 2010	budget 2011	werkelijkheid 2009	werkelijkheid 2010	budget 2011
Werkingskosten (incl afschr.)	35,46%	32,72%	31,66%	34,24%	34,84%	34,76%	33,09%	32,94%	35,81%
Billijke vergoeding	11,08%	9,31%	9,07%	9,46%	9,18%	10,26%	12,50%	10,42%	10,72%
Financiële lasten	5,53%	5,40%	6,81%	0,44%	0,27%	2,63%	2,68%	3,27%	3,90%
Kosten voor gebruik van het transmissienet	21,37%	23,96%	20,69%	23,44%	27,54%	24,69%	20,83%	27,17%	23,12%
Openbare dienstverplichtingen	15,16%	20,12%	24,53%	8,07%	8,04%	8,84%	7,96%	7,93%	6,96%
Netverliezen	5,47%	3,63%	2,72%	6,09%	4,35%	4,31%	13,63%	9,29%	10,39%
Heffingen	5,92%	4,86%	4,52%	18,25%	15,76%	14,51%	9,31%	8,98%	9,11%
TOTAAL BUDGET	**100,00%**	**100,00%**	**100,00%**	**100,00%**	**100,00%**	**100,00%**	**100,00%**	**100,00%**	**100,00%**

Figure 56 Samenstelling van het totaal budget van de distributienetbeheerders – werkelijkheid (Bron: Creg, 2012)

Appendix 4.2 Elia

Taken from; Elia.be, 2013

Legislative conditions ELIA

Elia's business activities are governed by European, national and regional legislation.

Europe

The European electricity market is notably governed by:

- Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC;
- Regulation (EC) no. 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) no. 1228/2003.

This legislation is part of the third energy package (a series of measures to liberalise the European Union's energy market). Visit the European Commission's website for more information.

Belgium

- Federal level
- Regional level

The Special Institutional Reform Act of 8 August 1980 awarded the federal and regional authorities joint responsibility for energy policy. The basic legislation for each level is based on similar principles:

- There is a legal separation between generation and sale on the one hand and system operation on the other.
- The transmission system operator retains a monopoly linked to strict rules of corporate governance.
- There is free access to the system at the approved and published tarrifs.
- The system operator has a public service obligation,such as being required to achieve a minimum level of electricity quality or to purchase green certificates.
- The system is monitored by a regulator.

Federal level

The federal authorities are responsible for 'matters which, on account of their technical and economic indivisibility, must be dealt with on an equal basis at national level', in other words matters that need a coordinated approach at national level. This also applies to energy transmission, i.e. the 150 kV to 380 kV high-voltage transmission system operated by Elia.

Elia has a legal monopoly as Belgium's transmission system operator. This licence is valid for 20 years and can be renewed. The federal government develops and drafts the tariff policy for the transmission system operator and the distribution system operators. The basic legislation at federal level is the law amending the Electricity Act of 29 April 1999 on the organisation of the electricity market. This law was published in the Belgian Official Gazette on 8 January 2012.

Regional level

The regions are responsible for distributing and transmitting electricity locally via networks with a nominal voltage of 70 kV or less.There is a distinction between operating systems with a voltage of 70 kV and those with a lower voltage. This means that distribution systems (with a voltage lower than 70 kV) operate alongside the following networks:

- the local transmission system (in Wallonia);
- the regional transmission system (Brussels-Capital region);
- the local transmission system (in Flanders).

These systems have a voltage of 70 kV and link up with the federal transmission system. Elia operates these systems. The three regions are also responsible for renewable energies (excluding federally governed North Sea wind farms) and the rational use of energy (RUE). The basic legislation for each region is the following:

- Flanders: Energy Decree of 8 May 2009;
- Wallonia: Decree of 12 April 2001;
- Brussels-Capital: Ordinance of 19 July 2001.

4.3 Appendix A Decree

Taken from: http://www.vreg.be/sites/default/files/uploads/ontwerpbesluit_groene_warmte.pdf

Ontwerp van besluit tot wijziging van het Energiebesluit wat betreft de invoering van een steunregeling voor nuttige groene warmte, zoals principieel goedgekeurd door de Vlaamse Regering op 15 juli 2011

Totstandkoming decreet en besluit

Een **decreet** ontstaat ofwel als ontwerp ofwel als voorstel. Als het initiatief voor een nieuw decreet uitgaat van de Vlaamse regering, spreken we van een **ontwerp van decreet.** Na opmaak van een **eerste ontwerptekst** (= voorontwerp) wordt dit, samen met een nota aan de Vlaamse regering (= de memorie van toelichting), de adviezen van de Kanselarij (legistiek en taalkundig advies), (eventueel) van de Inspectie van Financiën (begrotingscontrole) en het zogenaamde RIA-advies (reguleringsimpactanalyse), voorgelegd aan de Vlaamse regering met het oog op de **eerste principiële goedkeuring.**

Na deze eerste principiële goedkeuring volgt het inwinnen van een aantal **adviezen.** De tekst van het ontwerp wordt indien nodig aangepast en opnieuw aan de Vlaamse regering voorgelegd voor de **tweede principiële goedkeuring**. Ontwerpen met betrekking tot de energiemarkt worden in het Vlaams Gewest steeds (minstens) voorgelegd aan de SERV (Sociaal-Economische Raad van Vlaanderen), de Minaraad (Milieu- en Natuurraad van Vlaanderen) en de VREG (Vlaamse reguleringsinstantie voor de elektriciteits- en gasmarkt).

Na de tweede principiële goedkeuring wordt het ontwerp voorgelegd aan de **afdeling Wetgeving van de Raad van State**. Het ontwerp wordt daarna samen met de toelichting (= de memorie van toelichting), adviezen van geraadpleegde adviesorganen en advies van de Raad van State, een laatste keer aan de regering voorgelegd voor definitieve goedkeuring. Hiermee eindigt de voorbereidende fase en **begint de parlementaire fase.** Het ontwerp wordt bij het parlement ingediend, waar het eerst in de bevoegde commissie, daarna in plenaire vergadering besproken en eventueel geamendeerd wordt, waarna het goedgekeurd wordt.

Als het initiatief voor een nieuw decreet uitgaat van een **volksvertegenwoordiger** spreken we van een **voorstel van decreet**. Dergelijk voorstel ontstaat al in het parlement zelf, zodat enkel de parlementaire fase doorlopen wordt. In die fase moet wel nog, uiterlijk voor de eindstemming in de plenaire vergadering, een advies van de afdeling Wetgeving van de Raad van State ingewonnen worden. Na stemming in het parlement volgt de bekrachtiging, afkondiging, en ten slotte de **publicatie in het Belgisch Staatsblad.**

Een **besluit** geeft uitvoering aan een decreet en wordt daarom **niet in het parlement** behandeld. Een besluit kan dus enkel ontstaan **op initiatief van de Vlaamse regering** of de bevoegde minister. Na de definitieve goedkeuring wordt het besluit meteen bekrachtigd, afgekondigd en gepubliceerd. Voor een **dynamisch stappenplan** dat wegwijs maakt in het regelgevingsproces kan ook verwezen worden naar volgend stroomschema**.**

4.4 Appendix. Energy Price Evolution

Taken from: Creg , 2012.

52. In onderstaande figuur wordt de evolutie van de totaalfactuur voor een Dc-klant (totaalverbruik 3.500 kWh/jaar) met tweevoudige meter (1.600 kWh dag en 1.900 kWh nacht) weergegeven voor de periode 2009-2011. Dit gebeurt op basis van de prijsformule Electrabel EnergyPlus (ELEK 20) en zowel voor het Vlaamse Gewest (Imewo), het Waalse Gewest (IEH) en het Brussels Hoofdstedelijk Gewest (Sibelga). De prijzen zijn uitgedrukt in EUR/MWh en inclusief BTW.

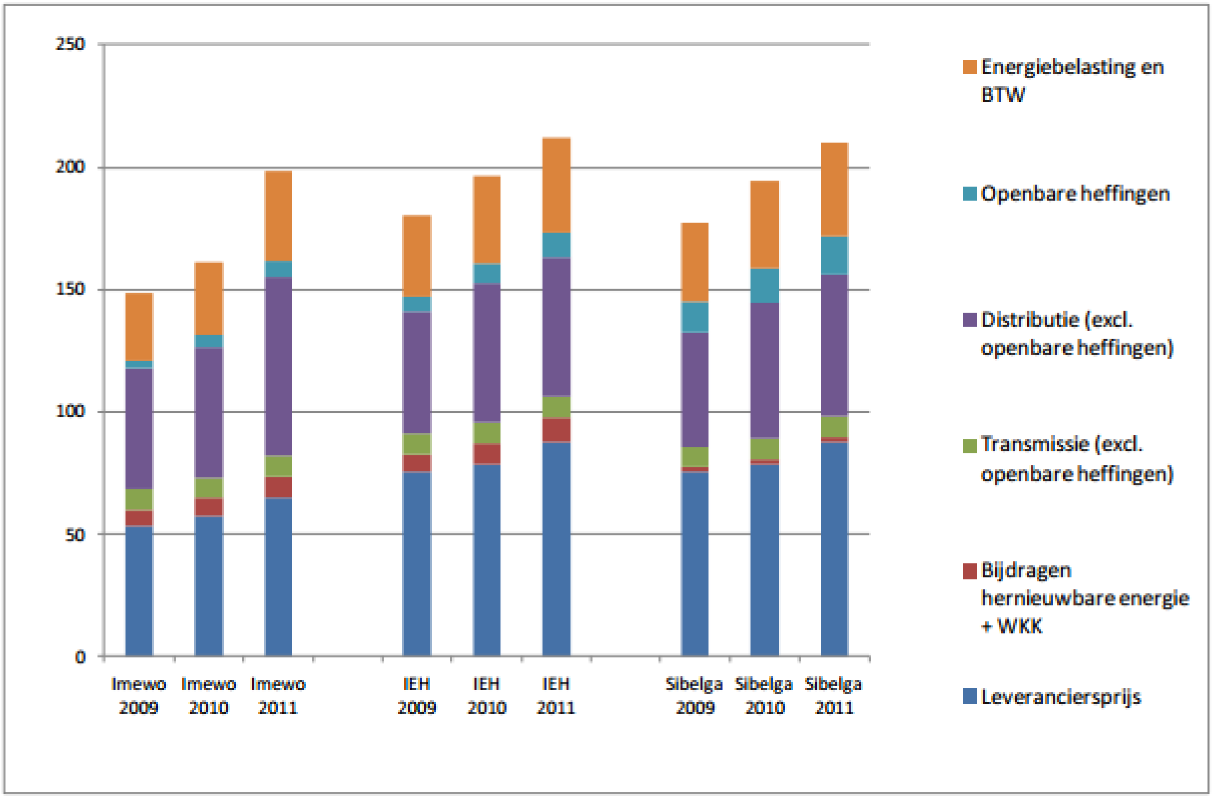


Figure 57 Overzicht totaalfactuur elektriciteit Dc-klant (CREG rapport, 2012)

53. De voornaamste vaststellingen zijn:
- de totale elektriciteitsfactuur over de periode 2009-2011 stijgt, ongeacht het Gewest;
- de sterkste stijging vond plaats in Vlaanderen, van 2010 naar 2011;
- de belangrijkste componenten in de totaalfactuur zijn de leveranciersprijs en het distributienettarief.

55. We stellen vast dat in 2011 de component distributienettarief het zwaarste doorweegt (36,80%) in de totaalfactuur. Deze component is daarenboven over de periode 2009-2011 ook sterk gestegen (+ 48,44% op basis van de hier weerhouden DNB's). Voor andere DNB's weegt het distributienettarief nog zwaarder door (vb.: Gaselwest: 41,79% in 2011).

56. Ook de component leveranciersprijs heeft een belangrijk aandeel in de totaalfactuur (voor het jaar 2007 betreft het 32,71%). Deze stijgt over de periode 2009-2011 echter niet zo sterk als het distributienettarief (+ 21,52%).

4.5 Appendix Governmental charges

Taken from: Creg , 2012.

In deze bijlage wordt ingegaan op de heffingen, toeslagen en belastingen die een onderdeel van de energiefactuur uitmaken. In de bespreking wordt een onderscheid gemaakt tussen elektriciteit en gas.
Binnen het hoofdstuk elektriciteit wordt een opsplitsing gemaakt tussen België en de buurlanden. Er wordt verder ook opnieuw aandacht geschonken aan de verschillende typeklanten: residentieel (Dc), professioneel (Ic1) en de industrie.

Openbare heffingen

141. Deze post omvat de openbare heffingen van de verschillende tariefcomponenten

Deze zijn via de leveranciers:
- aansluitingsvergoeding (enkel in Wallonië);
- bijdrage ter financiering van de openbare dienstverplichtingen (enkel in Brussel).

Deze zijn via het transmissienettarief;
- federale bijdrage;
- financiering maatregelen ter bevordering van de REG;
- financiering aansluiting offshore windturbineparken;
- gebruik van het openbaar domein (enkel Vlaanderen);
- tussenkomst in aansluiting productie hernieuwbare energie;
- toeslag groenestroomcertificaten.

Deze zijn via het distributienettarief:
- wegenisvergoeding;
- Elia-heffing (voor alle Vlaamse DNB's tot en met 2008)

BELGIË

Dc-klant

De belastingen en toeslagen zijn goed voor 20 à 25 % van de factuur van de Dc-klant. Dat percentage is de laatste drie jaar gestegen, zoals we kunnen zien in onderstaande tabel voor een Dc-klant met een Electrabel EnergyPlus-contract.

Tabel 5: Evolutie van het % van de toeslagen en belastingen in de factuur van de Dc-klant Electrabel EnergyPlus (Bron: CREG)

	2009	2010	2011
IMEWO	20,90%	21,70%	21,90%
IEH	21,80%	22,40%	23,00%
Sibelga	25,50%	25,60%	25,70%

We stellen vast dat het percentage van de taksen en heffingen over de periode 2009-2010 lichtjes is toegenomen. Aangezien de totaalfactuur is toegenomen over deze periode, impliceert dit dat de absolute bedragen voor toelagen, heffingen en belastingen tussen 2009 en 2011 ook moeten zijn gestegen. Dit blijkt inderdaad zo te zijn. Uit de volgende figuur kan worden afgeleid dat het voor

Vlaanderen (Imewo) gaat over een toename van 39%, voor Wallonië (IEH) 24% en voor Brussel (Sibelga) 19%. Grafisch kan dat als volgt worden weergegeven.

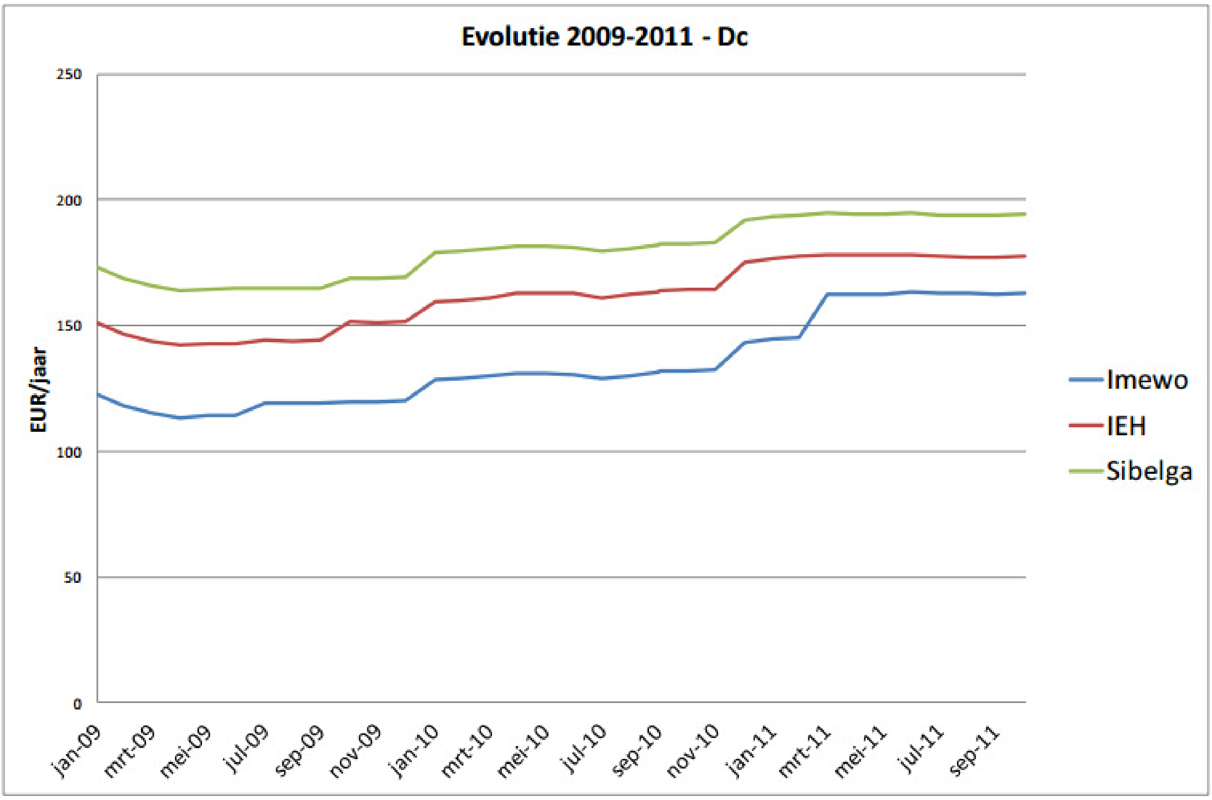


Figure 58 Evolutie van de toeslagen en belastingen tussen 2009 en 2011 - Dc

De variabiliteit resulteert uit de inaanmerkingneming van een contract met een geïndexeerde prijs en de daaropvolgende variatie van het bedrag van de BTW. De verklaring voor de regionale verschillen moet worden gezocht bij de heffing van specifieke gewestelijke belastingen. Hieronder wordt uiteengezet waarom Wallonië en Brussel een hoger percentage kennen dan Vlaanderen.

Wallonië :
- wegenisretributie om het verlies aan inkomsten van de gemeenten ten gevolge van de liberalisering van de markt en het wegvallen van het immaterieel dividend te compenseren;
- aansluitingsvergoeding.

Brussel :
- toeslag voor de financiering van de openbare dienstverplichtingen ten gunste van het sociale energiebeleid, het beleid inzake rationeel energiegebruik en de openbare verlichting in het Brussels Gewest. De volgende tabel splitst de totaalcijfers per DNB verder op en geeft meer inzicht in de verschillende toeslagen, heffingen en belastingen.

	Jaarlijks gemiddelde			2011	Evolutie 2011/20009	
	2009	2010	2011			
	EUR/jaar	EUR/jaar	EUR/jaar	%	%	EUR/jaar
Imewo						
Energiebijdrage	6,68	6,68	6,68	4%	0%	0
Federale bijdrage	9,35	15,05	19,48	13%	108%	10
Heffingen transport (offschore, ...)	1,32	1,45	4,02	3%	205%	3
Wegenisretributie	1,19	1,16	1,15	1%	-4%	0
Aansluitingsvergoeding	0,00	0,00	0,00	0%		0
BTW	90,35	98,07	120,21	79%	33%	30
Totaal	**108,89**	**122,42**	**151,54**	**100%**	**39%**	**43**
IEH						
Energiebijdrage	6,68	6,68	6,68	4%	0%	0
Federale bijdrage	9,66	16,00	20,70	12%	114%	11
Heffingen transport (offschore, ...)	1,97	2,06	4,58	3%	132%	3
Wegenisretributie	7,32	7,57	7,71	5%	5%	0
Aansluitingsvergoeding	2,63	2,63	2,63	2%	0%	0
BTW	109,10	118,96	128,49	75%	18%	19
Totaal	**137,35**	**153,90**	**170,79**	**100%**	**24%**	**33**
Sibelga						
Energiebijdrage	6,68	6,68	6,68	4%	0%	0
Federale bijdrage	9,18	14,52	18,77	10%	104%	10
Heffingen transport (offschore, ...)	0,93	0,95	0,95	0%	2%	0
Wegenisretributie	20,39	20,43	21,07	11%	3%	1
Aansluitingsvergoeding	0,00	0,00	0,00	0%		0
ODV BXL [6; 9,5kVA] - EUR/jaar	13,56	13,56	13,80	7%	2%	0
BTW	107,86	118,15	127,95	68%	19%	20
Totaal	**158,60**	**174,30**	**189,21**	**100%**	**19%**	**31**

Figure 59 Componenten en evolutie van de toeslagen en belastingen (Bron: CREG)

Bij het analyseren van deze tabel stellen we het volgende vast:
- de BTW is de belangrijkste component, gevolgd door de federale bijdrage;
- de componenten die het sterkst zijn gestegen tussen 2009 en 2011 zijn: in absolute cijfers, de BTW die de stijging van de andere prijscomponenten en de federale bijdrage versterkt; in groeipercentage, de toeslagen op het transportnettarief (behalve bij Sibelga die het cascadesysteem niet toepast) en de federale bijdrage.

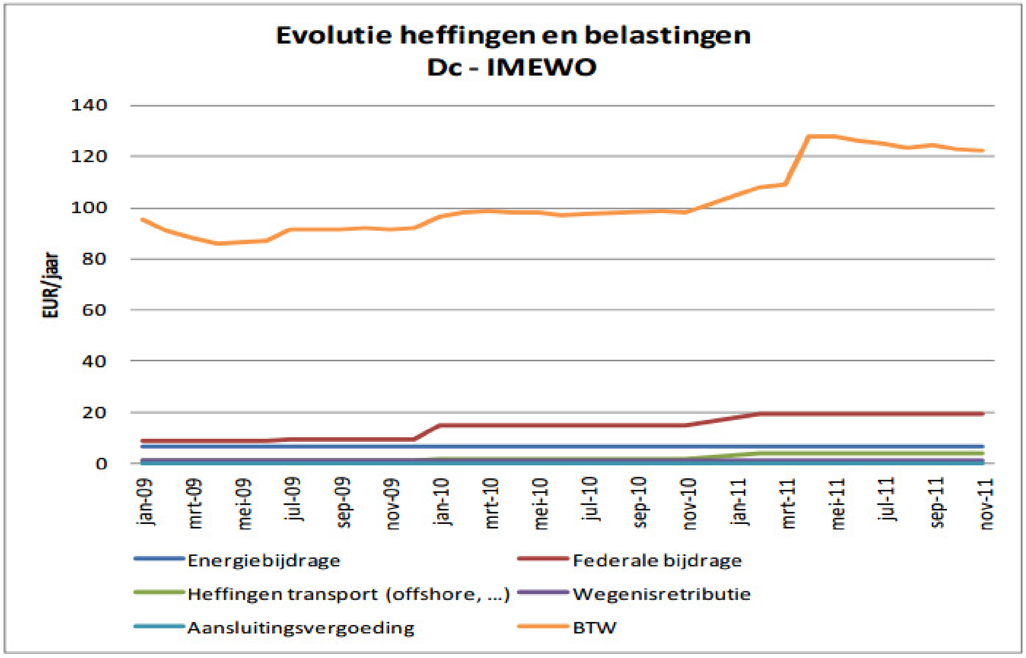


Figure 60 Evolutie van de toeslagen en belastingen tussen 2009 en 2011 (Dc - Imewo)

Uit het bovenstaande figuur kan worden afgeleid dat de BTW-component veruit de belangrijkste component is. Het BTW-percentage dat in België wordt toegepast is 21%, wat het hoogste is in vergelijking met de buurlanden. Voor middel en groot gebruikers zijn de belastingtarieven alsvolgt;

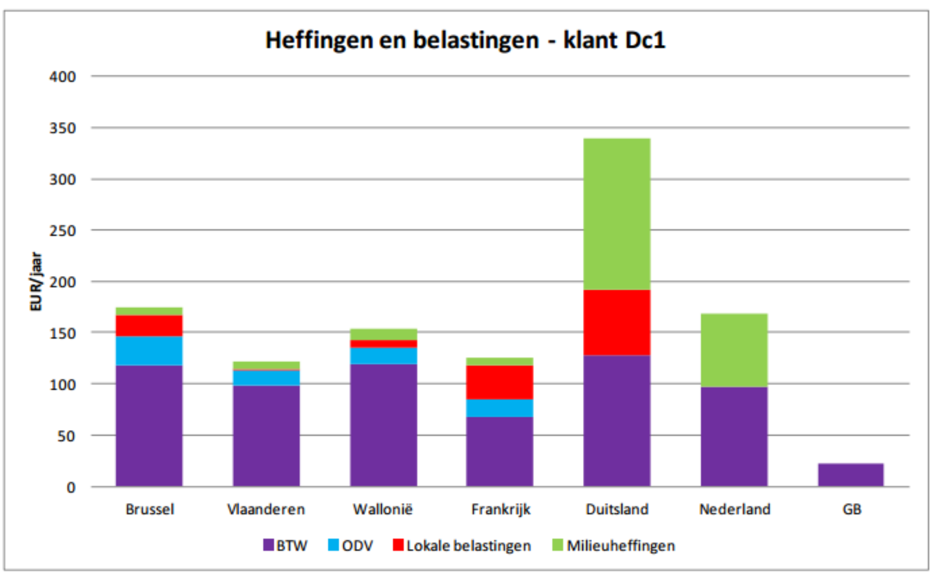


Figure 61 Vergelijking van de fiscaliteit in België met de 4 buurlanden in 2010 voor een klant van het Dc-type (Bron: CREG + Frontier)

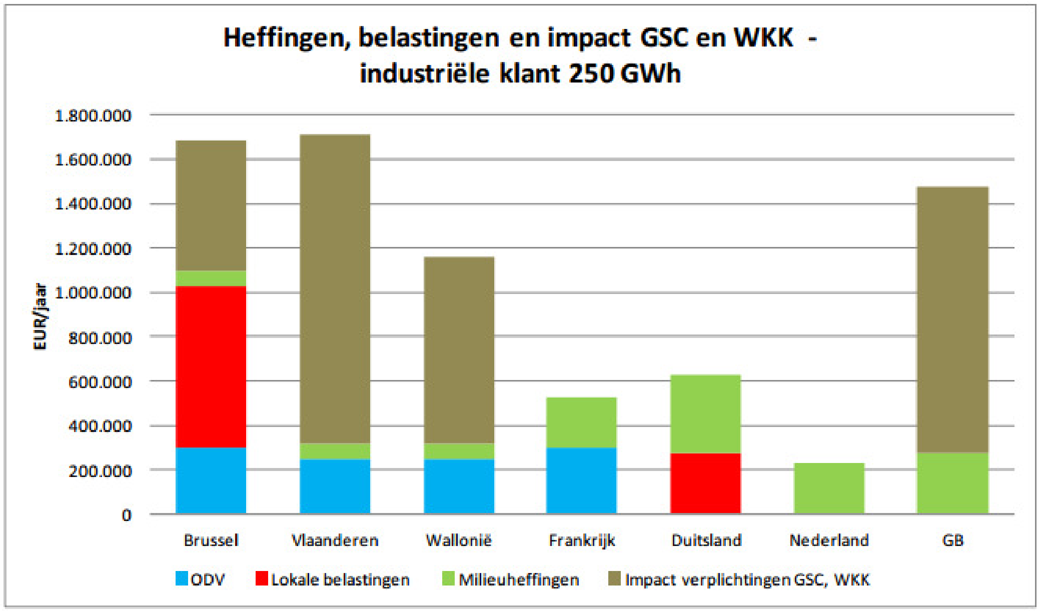


Figure 62 Vergelijking van de fiscaliteit in België met de 4 buurlanden in 2010 voor een klant van het type industrie 250 GWh (Bron: CREG + Frontier)

De federale bijdrage

De federale bijdrage werd in 2003 ingevoerd ter vervanging van de belastingen van sociale aard, die alleen bij de residentiële klanten werden geïnd (specifiek sociaal tarief, steunfonds), en van ecologische aard (REG-fonds, REG-productiefonds). De federale bijdrage is bedoeld om de openbare opdrachten van sociale, ecologische en marktregulerende aard te dekken. In de loop van de beschouwde periode werd de perimeter van de federale bijdrage uitgebreid. In 2003 omvatte deze de CREG-, de Kyoto- en de denuclearisatiebijdrage. Later werd hier nog de ODV-bijdrage aan toegevoegd. In 2005 kwam daar nog de toeslag 'beschermde klanten' en in 2009 de toeslag 'verwarmingspremie' bij. Dit alles doet echter niets af aan het feit dat de nominale waardeverdubbeling van de federale bijdrage (cfr. Tabel 3.3) naar de toekomst toe hervormingen noodzakelijk maakt.

Fonds	Bedrag (EUR/MWh)			Evolutie (%)
	2009	2010	2011	2011/2009
Dekking van de werkingskosten van de CREG	0,1220	0,1359	0,1517	24,34%
Financiering van de verplichtingen die voortvloeien uit de denuclearisatie van de nucleaire sites BP1 en BP2 te Mol-Dessel (Denuclearisatie)	0,8468	1,6925	2,3227	174,29%
Financiering van het federale beleid ter reductie van de emissies van broeikasgassen (Kyoto)	0,4460	0,8443	1,2928	189,87%
Financiering van de sociale maatregelen voorzien door de wet van 4 september 2002 houdende toewijzing van een opdracht aan de OCMW's inzake de begeleiding en de financiële maatschappelijke steunverlening aan de meest hulpbehoevenden inzake energielevering (ODV)	0,3424	0,4546	0,4877	42,44%
Financiering van de reële nettokost die voortvloeit uit de toepassing van maximumprijzen (Beschermde klanten)	0,7596	0,8269	0,8745	15,13%
Financiering van de forfaitaire verminderingen voor verwarming met elektriciteit (Premie verwarming)	0,0818	0,1143	0,1354	65,53%
Totaal federale bijdrage (excl. admin. kosten)	**2,5986**	**4,0685**	**5,2648**	**102,60%**
Forfaitaire kosten (0,8%)	2,6194			
Inclusief administratieve kosten klanten TNB			5,3227	
Inclusief administratieve kosten en netverliezen DNB			5,8608	

Figure 63Tabel 3.3: Federale bijdrage

Indien we de totale waarde van 5,8608 EUR/MWh uit 2011 vermenigvuldigen met het jaarverbruik van 3.500 kWh (3,5 MWh) dan geeft dit een totaal van 20,51 EUR/jaar (voor 2011). In 2009 was dat nog 9,17 EUR/jaar, m.a.w. meer dan een verdubbeling over de beschouwde periode. Dankzij de mogelijkheid die de producenten wordt geboden om hun productie te 'vergroenen', draagt een aanzienlijk aantal klanten niet langer bij tot het denuclearisatie- en het Kyotofonds, wat de heffing bij klanten die zich bevoorraden bij een leverancier met een minder gunstige fuel mix, aanzienlijk verzwaart. Dit vrijstellingsmechanisme zou dan ook herbekeken moeten worden. Een andere component waarvoor een voortdurende stijging kan worden opgetekend, is de bijdrage beschermde klanten. De toename in kwestie is daarbij te wijten aan verschillende elementen, met name:

- de automatisering van de toekenning van het sociaal tarief;
- de uitbreiding van de categorieën van rechthebbenden;
- de grotere bewustmaking van de potentiële begunstigden ten aanzien van hun recht op het sociaal tarief;
- de lagere opbrengst van de federale elektriciteitsbijdrage;
- het toenemende verschil tussen het sociaal tarief en het normale tarief dat met name te wijten is aan de herziening van de berekeningsformule van het sociaal tarief.

Appendix Chapter 5

Appendix 5.1 Guarantee of origin (GvO)

Taken from: http://www.vreg.be/garantie-van-oorsprong.

A guarantee of origin (GvO), garantie van oorsprong, is used as evidence for the origin of the produced electricity approved by article 1.1.3, 53° (vreg.be, 2012). A green GvO can be rewarded for the production of 1.000 Kwh electricity using renewable energy resources or a qualitative combined heat and power (CHP) installation. An electricity producer uses the GvO's as prove for the green produced energy. The GvO's are not energy specific, the certificate can also be cashed for later produced gray energy, what means they can be traded on the free market. It is only possible to cash the GvO's once after this the energy is "colored" and the status of the GvO changes from "not used" to "used". In the situation in which the energy is directly consumed by the producer no GvO's will be handed since the system is developed to inject more electricity to the grid. It is not possible to receive a GvO's and GSC for the same 1.000 kWh produced energy ().

Appendix 5.2 Restriction VAT reduction to 6%

Taken from: Federale Overheidsdienst FINANCIEN, 2007. Btw van 6% voor de renovatie van woningen. Dienst Communicatie, D/2007 -1418/5.

2. Wat zijn de voor waar den?
■ Het gebouw moet, na uitvoering der werken, als privé-woning of als ver blijf voor personen bedoeld onder punt 1, 2de ✓ worden aan ge wend.
a. Voor woningen

Privé-woningen
✓ uitsluitend als privé-woning gebruikt: tarief van 6%,
✓ aangewend voor een gemengd gebruik (d.w.z. deels als privé-woning, deels voor een beroeps werk zaamheid):
● indien privé-aanwending over heersend is en voor zover de onroerende handelingen wor den uitgevoerd aan het geheel van het gebouw, wordt het tarief van 6% éénvormig toe ge past,
● indien de privé-aanwending niet overheersend is:
- wordt het tarief van 21% toe ge past op de onroerende handelingen die
betrekking hebben op het be roeps ge deel te,
- wordt het tarief van 6% ver vol gens toegepast op de onroerende handelingen
die betrekking hebben op het privé-gedeelte.

Appartementsgebouwen
Het toe te passen btw-tarief is afhankelijk van de bestemming dat aan elk appartement wordt gegeven.

✓ de onroerende handelingen worden verricht aan de privatieve delen:
zie privé-woningen hiervoor;

✓ de onroerende handelingen worden verricht aan de gemeenschappelijke delen van het gebouw en elke medeëigenaar draagt bij in de kosten in functie van zijn onverdeeld deel in de gemeenschappelijke delen: het tarief van de belasting verschuldigd op ieders deel in de kosten hangt af van de bestemming die hij aan zijn appartement heeft gegeven (zie ook privéwoningen hiervoor).

b. Voor verblijfsinrichtingen
✓ waarvan alle lokalen worden gebruikt voor huisvesting van be jaarden, leerlingen en studenten, min der ja ri gen, thuislozen en personen in moeilijkheden: tarief van 6%,
✓ waarvan, naast de lokalen bestemd voor de huisvesting van de be oog de personen, eveneens lokalen worden gebruikt voor andere doeleinden:

● tarief van 6% voor lokalen bestemd voor de huisvesting van de beoogde personen,
● tarief van 21% voor lokalen gebruikt voor doeleinden die geen verband houden met de huisvesting (bv. klaslokalen en auditoria van scholen of universiteiten, beschermde werk plaat sen voor gehandicapten, enz.).

■ De werken moeten worden ver richt aan een privé-woning van min stens 5 jaar
en minder dan 15 jaar. De beoogde woningen en ver blijf sin richtingen moeten voor de toepassing van het verlaagd btw-tarief sedert ten minste 5 jaar en minder dan 15 jaar in gebruik zijn genomen.
■ De werken moeten onroerende han de lin gen zijn. (zie lijst onder punt 3 hierna).Er is eveneens een gunstregeling voorzien voor werken uitgevoerd aan woningen en verblijfsinrichtingen die minstens 15 jaar in gebruik zijn genomen. Deze regeling wordt toegelicht in deel 2 van deze brochure.
■ De werken moeten door een geregistreerd aannemer worden uitgevoerd en gefactureerd aan een eindverbruiker.

De aannemer moet op het tijdstip van het sluiten van het aanemings contract geregistreerd zijn als zelfstandig aannemer overeenkomstig de artikelen 400 en 401 van het Wetboek der inkomstenbelastingen 1992. Het is aangewezen dat u steeds nagaat of de aannemer aan wie u een opdracht wilt geven een dergelijke registratie bezit. Het btw-nr. gevolgd door het registratiekenmerk moet trouwens voorkomen op alle handelsdocumenten en fi scale stukken die aan de klanten worden uitgereikt.

Appendix 5.3 Ecology Premium

Taken from;
http://www.agentschapondernemen.be/sites/default/files/documenten/ep_20100115_algemene_infoteksten.pdf.

Welke ondernemingen komen in aanmerking voor een ecologiepremie?
Een onderneming dient aan volgende voorwaarden te voldoen:

- Zij realiseert haar investeringen in het Vlaamse Gewest;
- Zij oefent een aanvaardbare hoofdactiviteit (NACE-code) uit;
- Een administratieve overheid heeft geen dominerende invloed in de onderneming.

Er is een vermoeden van een dominerende invloed indien 50% of meer van het kapitaal of de stemrechten van deze onderneming rechtstreeks of onrechtstreeks in handen van een administratieve

overheid zijn. Dit vermoeden kan weerlegd worden indien de onderneming kan aantonen dat de administratieve overheid geen dominerende invloed uitoefent op het beleid van de onderneming;
- Zij is toegetreden tot het benchmarking convenant indien zij een energie intensief bedrijf is (een bedrijf met een energieverbruik van ten minste 0,5 Pj en bedrijven die onder de Europese richtlijn van verhandelbare emissierechten vallen).
- Als grote onderneming toont zij het stimulerende karakter van de steun aan.

Financiering via een patrimoniumvennootschap.
De investeringen kunnen worden uitgevoerd door een patrimoniumvennootschap die behoort tot dezelfde groep als de steunaanvragende onderneming. Beide vennootschappen behoren tot dezelfde groep in één van de volgende gevallen:

1) de patrimoniumvennootschap participeert voor ten minste 25 % in de steunaanvragende onderneming;
2) de steunaanvragende onderneming participeert voor ten minste 25 % in de patrimoniumvennootschap;
3) een natuurlijke persoon of rechtspersoon participeert voor ten minste 25 % in beide vennootschappen.

Bij een financiering van de investeringen via de patrimoniummaatschappij is het de exploitatievennootschap die de steunaanvraag indient terwijl de boeking en de afschrijving van de investeringen gebeuren bij de patrimoniummaatschappij. Het is de steunaanvragende exploitatievennootschap die de ecologiepremie ontvangt. De toepassing van de termijn van vijf jaar, vermeld in artikel 6 van het besluit van de Vlaamse Regering, wordt verstaan als het gedurende vijf jaar ter beschikking stellen aan de steunaanvragende onderneming.

De grootte van een onderneming
Voor de bepaling van de hoogte van de ecologiepremie wordt er een onderscheid gemaakt tussen ‘kleine en middelgrote ondernemingen’ (KMO’s) en ‘grote ondernemingen’ (GO’s).

Een kleine onderneming voldoet aan elk van de volgende criteria:
- Zij stelt minder dan 50 werkzame personen tewerk;
- Zij heeft een jaaromzet of een jaarlijks balanstotaal van maximaal 10 miljoen euro;

Een middelgrote onderneming voldoet aan elk van de volgende criteria:
- Ze stelt minder dan 250 werkzame personen tewerk;
- Ze heeft een jaaromzet van maximaal 50 miljoen euro of een jaarlijks balanstotaal van maximaal 43 miljoen euro;
- Ze is geen kleine onderneming.

Een grote onderneming is een onderneming die noch klein noch middelgroot is.

De tewerkstelling, de jaaromzet en het balanstotaal van de onderneming, worden berekend overeenkomstig de door de Europese Commissie vastgestelde definitie van kleine en middelgrote ondernemingen, vermeld in bijlage I bij Verordening (EG) nr.364/2004 van de Commissie van 25 februari 2004 tot wijziging van Verordening (EG) nr. 70/2001 van de Commissie wat betreft uitbreiding van het toepassingsgebied tot steun voor onderzoek en ontwikkeling. De gegevens voor de berekening van de jaaromzet en het balanstotaal van de onderneming hebben betrekking op de referentieperiode. De referentieperiode is het boekjaar waarop de laatst bij de Nationale Bank van België neergelegde jaarrekening voor de datum van de steunaanvraag betrekking heeft en die beschikbaar is via een centrale databank. Om de omzet te berekenen, wordt een boekjaar van meer of minder dan twaalf maanden herberekend tot een periode van twaalf maanden. Voor ondernemingen die geen jaarrekening moeten opmaken, is de referentieperiode het jaar van de laatste aangifte bij de directe belastingen voor de datum van de steunaanvraag. De gegevens voor de berekening van de tewerkstelling van het aantal werkzame personen worden vastgesteld aan de hand van het aantal werknemers dat in de onderneming was tewerkgesteld in de referentieperiode. Onder referentieperiode wordt verstaan de periode van tewerkstelling gedurende de laatste vier kwartalen die de Rijksdienst voor Sociale Zekerheid kan attesteren, voor de datum van de steunaanvraag, en die beschikbaar zijn via een centrale databank.

Samenwerkingsverbanden.
Er kan ook steun verleend worden aan samenwerkingsverbanden van ondernemingen op voorwaarde dat zowel het samenwerkingsverband als de aan het samenwerkingsverband deelnemende ondernemingen voldoen aan de defintie van “onderneming’, wat wil zeggen: de natuurlijke personen die koopman zijn of een zelfstandig beroep uitoefenen, handelsvennootschappen met rechtspersoonlijkheid, burgerlijke vennootschappen met handelsvorm, de Europese economische samenwerkingsverbanden en de economische samenwerkingsverbanden, die beschikken over een exploitatiezetel in het Vlaamse Gewest of zich ertoe verbinden in het Vlaamse Gewest een exploitatiezetel te vestigen (art. 3, 1°, van het decreet van 31 januari 2003 betreffende het economisch ondersteuningsbeleid, gewijzigd bij de decreten van 15 juli 2005 en 23 december 2005).

Handelsvennootschappen met rechtspersoonlijkheid zijn (art. 2 wetboek van vennootschappen):

- Naamloze vennootschap, NV
- Besloten vennootschap met beperkte aansprakelijkheid, BVBA
- Coöperatieve vennootschap, CVBA of CVOA
- Vennootschap onder firma, VOF
- Gewone commanditaire vennootschap
- Commanditaire vennootschap op aandelen
- Economisch samenwerkingsverband, ESV
- Europese vennootschap, SE
- Europese Coöperatieve vennootschap, SCE

Volgende ondernemingen die geen rechtpersoonlijkheid hebben komen noch als amenwerkingsverband noch als deelnemende onderneming niet in aanmerking:

• De tijdelijke handelsvennootschap
• De feitelijke vereniging
• De stille handelsvennootschap
• De maatschap

Ook zijn VZW’s uitgesloten als samenwerkingsverband.

De hoofdactiviteit van de aan het samenwerkingsverband deelnemende ondernemingen moet behoren tot de aanvaardbare sectoren.

Appendix 5.4 Calculations Unprofitable top

Taken from: **http://www.vreg.be/sites/default/files/adviezen/adv-2012-8_0.pdf**

Artikel 16 – vooropgesteld artikel 6.2./1.1 - representatieve projectcategorieën voor groene stroom.

De berekening van de onrendabele top voor de representatieve projectcategorieën is een jaarlijks terugkerende taak voor het Vlaams Energieagentschap. Dat lijkt weinig zinvol voor representatieve projectcategorieën waarin weinig actuele projecten worden gerealiseerd. Bovendien stelt het Vlaams Energieagentschap een formulier ter beschikking om een bijkomende representatieve projectcategorie aan te vragen. Daarom lijkt het aan te bevelen het aantal representatieve projectcategorieën zoveel mogelijk te beperken, afgestemd op de huidige realiteit. In de volgende voorgestelde representatieve projectcategorieën, opgenomen in artikel 16 van het Ontwerpbesluit, stelt de VREG vast dat er sinds 1 januari 2011 niet meer dan één nieuw project werd aangemeld:

3° biogasinstallaties met een maximaal elektrisch vermogen tot 20 MW

b) voor GFT-vergisting met nacompostering;
c) recuperatie van stortgas;
d) voor vergisting van rioolwaterzuiveringsslib;
e) overige vergisters;

6° installaties voor de verbranding van biomassa-afval met een maximaal elektrisch vermogen tot 20 MW;

7° installaties voor de verbranding van huishoudelijk of bedrijfsafval met een maximaal elektrisch vermogen tot 20 MW.

Wat de installaties voor de verbranding van vaste of vloeibare biomassa betreft, blijkt het overgrote deel van de installaties een maximaal elektrisch vermogen te hebben tot 10 kW. Bovendien worden er recent ook veel biogasinstallaties tot 10 kW aangemeld, de zogenaamde pocketvergisters. De VREG stelt daarom voor de in artikel 16 voorgestelde representatieve projectcategorieën te vervangen door:
"1° zonne-energie:
a) installaties met een maximaal AC-vermogen van de omvormer(s) tot 10 kW;
b) installaties met een maximaal AC-vermogen van de omvormer(s) van 10 kW tot 250 kW;
c) installaties met een maximaal AC-vermogen van de omvormer(s) van 250 kW tot 750 kW;

2° windenergie op land, met een maximaal elektrisch vermogen per turbine tot 4 MW:

3° biogasinstallaties met een maximaal elektrisch vermogen tot 10 kW

a) voor de vergisting van hoofdzakelijk mest- en/of land- en tuinbouwgerelateerde stromen;

4° biogasinstallaties met een maximaal elektrisch vermogen tot 20 MW
a) voor de vergisting van hoofdzakelijk mest- en/of land- en tuinbouwgerelateerde stromen;
b) voor de vergisting van niet land- en tuinbouwgerelateerde stromen;

5° installaties voor de verbranding van vaste biomassa met een maximaal elektrisch vermogen tot 10 kW;

6° installaties voor de verbranding van vloeibare biomassa met een maximaal elektrisch vermogen tot 10 kW;"

Appendix 5.5 Quotum Calculations

Taken from: http://www.vreg.be/systeem-groenestroomcertificaten

Het aantal groenestroomcertificaten dat in een bepaald jaar n moet worden ingediend, wordt vanaf 31 maart 2013 vastgesteld met de formule: C=Gr * Ev * Btot, waarbij
- C gelijk is aan het aantal in het jaar in te dienen groenestroomcertificaten door een bepaalde leverancier/toegangshouder

- Ev gelijk is aan de totale hoeveelheid elektriciteit, uitgedrukt in MWh die in het jaar n-1 afgenomen werd op afnamepunten in het Vlaamse Gewest waarop de betrokken persoon geregistreerd stond als leverancier/toegangshouder in het toegangsregister van de betrokken elektriciteits distributienetbeheerder, beheerder van een gesloten distributienet, beheerder van het plaatselijke vervoernet van elektriciteit of beheerder van het transmissienet. Daarbij wordt de afname per afnamepunt beperkt tot de afname tijdens de periode waarin de betrokken persoon geregistreerd stond als leverancier/toegangshouder;

- Gr gelijk is aan:
1° 0,14 in 2013;
2° 0,155 in 2014;
3° 0,168 in 2015;
4° 0,18 in 2016;
5° 0,19 in 2017;
6° 0,195 in 2018;
7° 0,20 in 2019;
8° 0,205 in 2020;
9° 0,205 in 2021;

- Btot gelijk is aan de totale bandingcoëfficiënt : de verhouding tussen het aantal toegekende, voor de certificatenverplichting aanvaardbare groenestroomcertificaten in jaar n-2 en de totale bruto productie van groene stroom in jaar n-2 in het Vlaamse Gewest.

Wanneer een bandingfactor wordt vastgesteld voor een installatie voor de productie van groene stroom met een nominaal elektrisch vermogen van meer dan 20 MW, wordt het aantal in te dienen groenestroomcertificaten geëvalueerd en eventueel verhoogd door de Vlaamse Regering.

In de bepaling van Ev wordt een gedeeltelijke vrijstelling toegepast voor afnamepunten met grote verbruikers. Per afnamepunt waar één of meerdere leveranciers/toegangshouders leveren, wordt het jaarverbruik verminderd met de volgende hoeveelheden:

1° voor de afname tussen 1 000 MWh en 20 000 MWh elektriciteit in het jaar n-1 op een bepaald afnamepunt, 40 % van deze afnameschijf, uitgedrukt in MWh, naar rata van de hoeveelheid elektriciteit die werd afgenomen op het afnamepunt gedurende de periode in het jaar n-1 waarin de betrokken persoon leverancier/toegangshouder was. Deze vermindering geldt enkel voor bedrijfsvestigingen waarvan de hoofdactiviteit behoort tot NACE-BEL 2008 code 05 tot en met 33 (industrie en winning van delfstoffen;

2° voor de afname tussen 20 000 MWh en 100 000 MWh elektriciteit in het jaar n-1 op een bepaald afnamepunt, 75 % van deze afnameschijf, uitgedrukt in MWh, naar rata van de hoeveelheid elektriciteit die werd afgenomen op het afnamepunt gedurende de periode in het jaar n-1 waarin de betrokken persoon leverancier/ toegangshouder was;

3° voor de afname tussen 100 000 MWh en 250 000 MWh elektriciteit in het jaar n-1 op een bepaald afnamepunt, 80 % van deze afnameschijf, uitgedrukt in MWh, naar rata van de hoeveelheid elektriciteit die werd afgenomen op het afnamepunt gedurende de periode in het jaar n-1 waarin de betrokken persoon leverancier/ toegangshouder was;

4° voor de afname boven 250 000 MWh elektriciteit in het jaar n-1 op een bepaald afnamepunt, 98 % van deze afnameschijf, uitgedrukt in MWh, naar rata van de hoeveelheid elektriciteit die werd afgenomen op het afnamepunt gedurende de periode in het jaar n-1 waarin de betrokken persoon leverancier/ toegangshouder was;

5° de hoeveelheid elektriciteit waarvoor door grote verbruikers of gegroepeerde verbruikers met een totaal verbruik van meer dan 5 GWh in naam van de certificaatplichtige groenestroomcertificaten werden ingediend;

De modaliteiten en de te volgen procedure voor de indiening van de groenestroomcertificaten door grote verbruikers of gegroepeerde verbruikers zullen worden bepaald door de Vlaamse Regering;

Procedure

De netbeheerders rapporteren aan de VREG hoeveel elektriciteit elke leverancier/toegangshouder geleverd heeft. Zo berekent de VREG hoeveel groenestroomcertificaten elke

leverancier/toegangshouder moet inleveren. De VREG brengt de leveranciers/toegangshouders schriftelijk op de hoogte en zij moeten dan vóór 31 maart het vereiste aantal GSC's inleveren via de online databank
Als elektriciteitsleverancier/toegangshouder kunt u GSC's kopen of zelf aanvragen voor uw eigen productie. De certificaten kunnen tot 10 jaar na de toekenning ingeleverd worden. Let op: enkel GSC's die werden toegekend door de VREG worden aanvaard voor de quotumplicht

5.6 Appendix Nettarieven

http://www.vreg.be/sites/default/files/adviezen/adv-2012-5.pdf

In de memorie van toelichting staat: "Daarnaast is de Vlaamse Regering met de netbeheerders overeengekomen dat de netbeheerders in 2012 een dossier voor het bekomen van een netvergoeding zullen voorleggen aan de CREG voor PV installaties op laag- en middenspanning. Deze vergoeding zal in functie zijn van de netkosten die worden gecreëerd. Dit vervangt eventueel bestaande injectietarieven."
Art.4.1.22/1 van het Energiedecreet verbiedt evenwel de aanrekening van injectietarieven: "De netbeheerder voert alle taken die noodzakelijk zijn voor de injectie van elektriciteit, geproduceerd door middel van hernieuwbare energiebronnen en kwalitatieve warmte-krachtkoppeling, met uitzondering van de aansluiting op het distributienet of het plaatselijk vervoernet, kosteloos uit. De kosten die hiervoor ten laste gelegd worden van de netbeheerder, worden beschouwd als kosten ten gevolge van de openbaredienstverplichtingen van de netbeheerder als netbeheerder." De VREG heeft bij MEDE-2011-1 van 15 februari 2011 verdere invulling hieraan gegeven en ziet toe op het naleven van dit verbod. Daarbij is het duidelijk dat de netvergoeding waarvan sprake wel degelijk valt te beschouwen als een injectietarief, in de zin dat het een tarief is voor het gebruik van het net (en niet een tarief voor de aansluiting op het net).

De VREG merkt op dat de tekst van de memorie dus ingaat tegen de tekst van het hogervermeld artikel van het Energiedecreet. Het betrokken artikel moet volgens de VREG worden geschrapt, zodat de gewenste invoering van injectietarieven mogelijk wordt gemaakt. Daarbij dient benadrukt te worden dat het goedkeuren van tarieven of tariefmethodologie een exclusieve bevoegdheid is van de regulator. Binnen de huidige bevoegdheidsverdeling tussen het federale niveau en de gewesten is dit de federale regulator CREG.

De VREG is voorstander van een grondige evaluatie van de gehanteerde tariefmethodologie, in het licht van de aangekondigde overheveling van de tarifaire bevoegdheid naar de gewesten. Daarom ook heeft hij aan de CREG gevraagd om de huidige methodologie voor twee jaar te bevriezen. Dit moet toelaten om een geïntegreerde analyse uit te voeren waarin alle essentiële elementen van een tariefbeleid aan bod komen. De invoering van een injectietarief kan daarbij niet los gezien worden van (de vastlegging van) het geheel aan inkomsten van de netbeheerder, en bijgevolg moeten ook de tarieven voor de afname van het net in voorkomend geval worden herbekeken. De stijgende inkomsten voor de netbeheerders als gevolg van de (nieuwe) aanrekening van injectietarieven moeten immers logischerwijs gepaard gaan met een daling van de inkomsten uit de tarieven voor afname. ADV-2012-5

Inwerkingtreding decreet
Er is geen overgangsbepaling opgenomen in het voorstel van decreet. Dit is echter nodig om de VREG toe te staan om bepaalde IT-aanpassingen door te voeren voor wat de nieuwe, maar ook de bestaande dossiers betreft (bv. beperking duurtijd toekenning certificaten, startdatum toevoegen aan bestaande dossiers, toepassing van bandingsfactoren mogelijk maken, …). De meeste artikelen van het decreet zouden (ten vroegste) in werking moeten treden op 1 januari 2013. De artikelen 6, 8, 1°, 3° en 4°, zouden dan weer vroeger in werking moeten treden, bijvoorbeeld ten laatste op 1 augustus 2012.

Appendix 5.7 Conditions per technology

Taken from: http://www.energiesparen.be/epb/groeneenergie.

Wat houdt de nieuwe EPB-eis precies in?

Er wordt een onderscheid gemaakt tussen eengezinswoningen, grote woongebouwen en kantoren en scholen.

Eengezinswoningen

Om aan de nieuwe EPB-eis te voldoen, moet de aangifteplichtige één van de zes maatregelen uit de onderstaande tabel toepassen in het bouwproject.

Voor elk van die maatregelen gelden een aantal voorwaarden om te garanderen dat het systeem voldoende hernieuwbare energie produceert (kwantitatieve voorwaarde), op een efficiënte wijze (kwalitatieve voorwaarde).

systeem	kwalitatieve voorwaarde	kwantitatieve voorwaarde
Zonneboiler	Helling: tussen 0° en 70° Oriëntatie: oost – zuid - west	Oppervlakte van de collector is minstens 0,02 m² per m² bruikbare vloeroppervlakte van de woning
PV-installatie	Helling: tussen 0° en 70° Oriëntatie: oost – zuid - west	De opbrengst (zoals berekend volgens EPB-berekeningsmethodiek) is minstens 7 kWh (vanaf 2016: minstens 10 kWh) per m² bruikbare vloeroppervlakte van de woning.
Biomassa	Rendement, volgens K.B. van 12/10/2010 ≥ 85% Emissieniveaus (CO en fijn stof) < grenswaarden uit fase III van K.B. van 12/10/2010	Toegepast als hoofdverwarming (dekt minstens 85% van de warmtevraag)

Warmtepomp	Seizoensprestatiefactor (SPF) > 4	Toegepast als hoofdverwarming (dekt minstens 85% van de warmtevraag)
Stadsverwarming en -koeling	Minstens 45% uit hernieuwbare energiebronnen	/
Participatie in project voor productie van hernieuwbare energie, waarvoor de vergunningen verleend werden na 01/01/2014	Project produceert minstens 7 kWh per m² bruikbare vloeroppervlakte van alle participaties samen	Participatie bedraagt minstens 20 € per m² bruikbare vloeroppervlakte van de woning.

Voor bouwprojecten die niet één van de zes maatregelen, volgens de geldende voorwaarden, toepassen, wordt het maximaal E-peil 10% strenger. Het bouwproject kan dus alsnog voldoen als het E-peil voldoet aan die strengere E-peileis. Dat kan door bijvoorbeeld bijkomende isolatie te voorzien, een efficiëntere verwarmingsinstallatie te gebruiken, een ventilatiesysteem met warmteterugwinning en/of vraagsturing te installeren, luchtdichter te bouwen,...

Kantoren en scholen

Voor kantoren en scholen kunnen de onderstaande maatregelen gecombineerd worden om in totaal minstens 10 kWh/jaar per m² bruikbare vloeroppervlakte uit hernieuwbare energie bronnen te halen.

systeem	**kwalitatieve voorwaarde**	**kwantitatieve voorwaarde**
Zonneboiler	Helling: tussen 0° en 70° Oriëntatie: oost – zuid - west	Minstens 10 kWh per m² bruikbare vloeroppervlakte van het gebouw
PV-installatie	Helling: tussen 0° en 70° Oriëntatie: oost – zuid - west	
Biomassa	Rendement, volgens K.B. van 12/10/2010 ≥ 85% Emissieniveaus (CO en fijn stof) < grenswaarden uit fase III van K.B. van 12/10/2010	
Warmtepomp	Seizoensprestatiefactor (SPF) > 4	
Stadsverwarming en -koeling	Minstens 45% uit hernieuwbare energiebronnen	
Participatie in project voor productie van hernieuwbare energie, waarvoor	Project produceert minstens 7 kWh per m² bruikbare vloeroppervlakte	

de vergunningen verleend werden na 01/01/2014 (*)	van alle participaties samen	

(*) Deze optie kan niet toegepast worden voor scholen en kantoren van publieke overheden met vergunningsaanvraag in 2013.

Voor bouwprojecten waarbij minder dan 10 kWh/jaar per m² bruikbare vloeroppervlakte uit hernieuwbare energiebronnen wordt gehaald, wordt het maximaal E-peil 10% strenger. Het bouwproject kan dus alsnog voldoen als het E-peil voldoet aan die strengere E-peileis. Dat kan door bijvoorbeeld bijkomende isolatie te voorzien, een efficiëntere verwarmings- of koelinstallatie te gebruiken, luchtdichter te bouwen, een performantere verlichtingsinstallatie te plaatsen,...

Woongebouwen met meer dan één wooneenheid

Grote woongebouwen hebben de keuze tussen de eis die aan eengezinswoningen wordt opgelegd en de eis die voor kantoren en scholen geldt.

Voor bouwprojecten die niet één van de zes maatregelen voor eengezinswoningen, volgens de geldende voorwaarden, toepassen en die geen 10 kWh/jaar per m² bruikbare vloeroppervlakte uit hernieuwbare energiebronnen halen, wordt het maximaal E-peil ook 10% strenger.

Appendix 5.8 The 8 possible transitions of a GSC in Flanders

Taken from: Laleman, 2009

Het GSC-systeem kan in 8 stappen samengevat worden:

1. De netbeheerders en producenten rapporteren maandelijks alle gegevens, die nodig zijn om de netto productie en injectie van elektriciteit uit hernieuwbare energiebronnen te bepalen.

2. Op basis van deze meetgegevens kent de VREG certificaten toe aan de producenten van groene stroom.

3. De producenten van groene stroom hebben de mogelijkheid om hun groenestroomcertificaten tegen een wettelijk vastgelegde minimumprijs te verkopen aan hun distributie- of transmissie netbeheerder.

4. Anderzijds kunnen de producenten van groene stroom de hen toegekende certificaten ook verkopen op de vrije markt aan traders of leveranciers, tegen een te onderhandelen prijs. Ook de netbeheerders kunnen de certificaten die zij hebben gekocht opnieuw te koop aanbieden.

5. Alle leveranciers die zich ertoe verbinden groene stroom te leveren aan eindafnemers, moeten maandelijks een aantal groenestroomcertificaten bij de VREG indienen voor gebruik als garantie van oorsprong. Dit aantal wordt bepaald door de hoeveelheid groene stroom die zij maandelijks leveren. De

VREG geeft deze certificaten daarna terug. Deze kunnen verder nog gebruikt worden voor de certificatenverplichting.

6. Groenestroomcertificaten die al als garantie van oorsprong zijn verbruikt, kunnen nog verder verhandeld worden op de vrije markt.

7. Alle leveranciers hebben de verplichting om jaarlijks een aantal groenestroomcertificaten bij de VREG in te dienen voor de certificatenverplichting, op straffe van een boete per ontbrekend certificaat. Dit aantal wordt bepaald als een percentage (het quotum) van de totale hoeveelheid stroom die zij in een jaar geleverd hebben. De VREG haalt het groenestroomcertificaat daarna uit de handel.

8. Los van de certificatenhandel, kan de producent zijn geproduceerde elektriciteit verkopen aan een trader of aan een leverancier die deze elektriciteit levert aan eindafnemers.