Business Model Challenge:
Learnings from a Local Solar Company in Germany

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Abstract:

Solar photovoltaic systems are considered as vital renewable energy sources to mitigate climate change and reduce dependency on fossil fuels. However in some countries, declining political support has resulted in decreasing diffusion of the photovoltaic systems. A case in point is Germany, the country with the highest installed capacity of photovoltaic systems. Given the new conditions in the German market, the diffusion rate declined continuously both in 2012 and 2013. Whether the diffusion rate will again take off is not known. While the recent literature has pointed out that the local solar companies have a vital driving role on diffusion, not many studies have yet discussed the business models and challenges such local companies may have. Through an extensive case study, this paper explores the business model of a local solar company in a town of 43000 habitants in southern Germany. The case of this company tells about an important business model challenge. Overcoming such challenge may not only let the company survive but also drive the diffusion of solar photovoltaic systems in the region. The results include implications for both industrial actors and policymakers.

Keywords: Diffusion, Innovation, Solar Photovoltaics, Business Model, Renewable Energy

1. Introduction

Germany is prominent among photovoltaic-power producing nations, accounting for one-third of the global photovoltaic systems' (PV) installed capacity (GTAI, 2013). Although it has a relatively limited solar radiation potential, it has outperformed the countries that have larger land area and higher solar radiation, such as France, Spain, Turkey, Brazil and Japan. The mechanisms behind the German story in PV diffusion have been discussed at length in the literature (e.g. Dewald and Truffer, 2011; Jacobsson and Lauber, 2006; Karakaya et al., 2014b). One of the most important factors have been the local solar initiatives that are the formalized networks of local solar companies and other legal entities (Dewald and Truffer, 2012). However, such local solar companies, are about to be on the edge of a cliff, given the new conditions in the market: declining political support, decreasing costs per PV installation and decreasing adoption rate of PV in local lead markets.

The management and economics literature has discussed the diffusion of innovations since decades ago. Early scholars of this phenomenon studied the technological change, explaining the impact of profitability and proportion of adopters on the diffusion (Griliches, 1957; Mansfield, 1961). There has been a general agreement that diffusion of innovations usually follows a typical s-curve in time dimension (see Bass, 1969; Rogers, 1962). The spatial dimension has also been found to be vital given the local factors which are heterogeneously spread in a geographic region (Brown, 1975; Hägerstrand, 1967). Such local factors have been studied in a variety of studies using various perspectives: local demand (Graham, 1998), peer effects (Arndt, 1967; Foster and Rosenzweig, 1995), local environmental conditions (Ormrod, 1990), proximity to early adopters (Baptista, 2000, 2001) and the role of local supplier companies (Fabrizio and Hawn, 2013).

In the realm of diffusion of environmentally friendly innovations such as PV, the literature has focused on the influence of policy (Kemp and Volpi, 2008; Rennings, 2000). This influence of policy has been wrestled with by various approaches in existing literature (see Karakaya et al., 2014a for a review) such as technological innovations systems (Hekkert et al., 2007), lead market model (Beise and Rennings, 2005), ecological modernization (Jänicke, 2008) and sustainable transitions (Spaargaren, 2003). Several studies have also empirically examined the importance of local and regional policies in the rapid diffusion of renewable energy systems (e.g. Kwan, 2012; Zhang et al., 2011). Studying the cases of PV in Germany, Dewald and Truffer (2012) find that the activities and services of local solar companies are vital in stimulating the diffusion. In the same manner, Fabrizio and Hawn (2013) suggest that in order to achieve rapid diffusion, policy makers should support such local solar companies. However, the existence of such solar companies is bound not only to policy interventions but also the business model that they have.

A business model explains how a company creates economic value (Chesbrough and Rosenbloom, 2002), describing the factors related to offering, market, strategy, internal capability, competition and investor (Morris et al., 2005). However, business models can sometimes be a challenge, e.g. during technology shifts (Tongur and Engwall, 2014) or towards sustainable transitions (Richter, 2013). Empirical studies on the impact of energy policy have already discussed the importance and the role of business models in different sectors, for example in heat energy production (Okkonen and Suhonen, 2010), electrical cars (Kley et al., 2011) and algae biofuel (Nair and Paulose, 2014). Although the business models in PV sector has also been discussed (e.g. Huijben and Verbong, 2013; Loock, 2012; Richter, 2013), the empirical focus has only been limited to the large sized electric utilities, solar cells production firms that compete globally and the business models of the adopters. However, less has been said about the business models of such local solar companies.

Responding to this gap, the aim of this paper is to discuss the business model challenge of a local solar company, in a small town in southern Germany. The company specializes in planning and installing PV solutions for the local customers in a radius of fifty km. It is not only the pioneer of its kind of in the region but also the co-founder of a local solar initiative, a network of partner companies in the spatial lead markets of PV diffusion (Karakaya et al., 2014b). By giving a detailed description of the case of this company and the challenge it has faced, this paper has the ambition of shedding some lights on the business model challenges of such local companies, which are known to be the local drivers of diffusion.

Apart from this introduction this paper consists of four other sections. Section 2 provides a theoretical background used for interpreting the data, while section 3 explains the methodology of the study. Section 4 presents the results and discussion, explaining the business model of the company and the challenge it has faced. Finally, section 5 provides conclusions and policy implications.

2. Theoretical Background

2.1. Diffusion of Photovoltaic Systems

The drivers, barriers and challenges of the diffusion of PV in Germany have been extensively discussed in the literature. Early studies have focused on the institutional and political challenges behind the diffusion that had occurred before 2004, the year the German National Renewable Energy Act (EEG) was amended. Jacobsson and Johnson (2000) developed an analytical framework on diffusion of renewable energy technologies, based on illustrative examples from Sweden and Germany. From a technological system perspective, they pointed out the importance of actors, networks and institutions on the successful transition to renewable energy technologies. In a later study, Jacobsson and Bergek (2004) also explained the success and failures in such transitions, analyzing the diffusion of renewable energy sources in Netherlands, Sweden and Germany. They identified the three major challenges that policy makers faced: difficulties in foreseeing the outcome of policy intervention; the long time scale of the diffusion process; and the political struggle to overcome the opposition from incumbent actors. Another study, focusing only on the German case (Jacobsson and Lauber, 2006), described the formation of political support for renewable energies as a “battle over institutions”. The regulatory frameworks supporting wind energy and PV in Germany faced the opposition from both coal and nuclear interests.

The later studies have discussed the some new aspects on PV market in Germany. On the one hand, Frondel et al., (2008) criticized the feed-in-tariff scheme of the EEG, pointing out the inefficiency of this scheme on greenhouse gas abatement. Rather than supporting the PV adopters with the feed-in-tariff, they instead recommended policy makers to support the PV production. On the other hand, Laird and Stefes (2009) discussed the German EEG as a role model to the USA. They identified the decades-long substantial political change as a driving factor on diffusion of PV, putting much stress on the positive effect of historical contingencies for the German success. In addition, Dewald and Truffer (2011) explained the importance of substructures in the market, identifying the different market segments of PV showing various patterns of diffusion.

Moreover, there is a common agreement that the local factors have been essential for enabling diffusion of PV on Germany. Dewald and Truffer (2012) identified that local solar initiatives have been vital to form the PV market, stimulating the rapid diffusion.

They argued that the success was not only because of the strong policy support or favorable geophysical conditions, but also because of the activities of local solar initiatives, shaping the PV market formation. In the same manner, Fabrizio and Hawn (2013) studied the role of local solar companies in the USA. Conceptualizing the local companies as complementary inputs, they identified these inputs as drivers of diffusion of PV. They recommended policy makers to incentivize the local companies in order to achieve a successful diffusion.

2.2. Business Models

The business model concept has been popularized in the last two decades, particularly in e-business, strategy, innovation and technology management related fields (Zott et al., 2011). Business models are the stories that explain how companies work and conduct business (Magretta, 2002: 4). If a business model is successful, it means that the model is able to mediate between the technology and the economic value creation (Chesbrough and Rosenbloom, 2002). Based on an extensive literature review, Morris et al., (2005) categorize the components of a business model as: factors related the offering, market factors, internal capability factors, competitive strategy factors, economic factors and personal/investor factors (see Table 1).

Table 1. Business Model Components (from Morris et al., 2005)

Component	Questions that underlie a business model
1. Factors related the offering	How do we create value?
2. Market factors	Who do we create value for?
3. Internal capability factors	What is our source of competence?
4. Competitive strategy factors	How do we competitively position ourselves?
5. Economic factors	How we make money?
6. Personal/investor factors	What are our time, scope, and size ambitious?

The factors related to the offering focus on the scope of the product or service offered by the company. This addresses the value proposition and creation. The value can be in different forms, including economic or social (Zott et al., 2011: 1029). Market factors are related to the scope of the market that the company competes; and the nature and geographic dispersion of the customers (Morris et al., 2005). Business model of a company focuses on a specified market segment or a group of customers (Chesbrough and Rosenbloom, 2002). Internal capability factors are about the source of competence. The competence of a company can come from various aspects such as production, selling, marketing, supply chain management or creative capability (Morris et al., 2005). Competitive strategy factors formulate how the firm gains advantage over rival companies. For example, competitive advantage can be gained by managing environmental innovations (Shrivastava, 1995). Economic factors provide the logic behind how to earn profits. The Business model estimates the profit potential of the offering, based on value chain (Chesbrough and Rosenbloom, 2002). Personal/investor factors are based on the investment model of the company. Morris et al. (2005) define some examples of such model as: subsistence model, aiming to meet basic standarts and survive; income model, restricted on stable income stream; growth model, targetting for re-investments and growth; and finally, speculative model with a goal of demonstration of venture potential and selling out.

The Business model of a company can evolve over time (Morris et al., 2005). However it is often a challenge to change the business model (e.g. see Tongur and Engwall, 2014). Particularly, the companies in renewable energy sector, including PV, are bound to be influenced by the unexpected risks and opportunities, which are often created by policy measures (Wüstenhagen and Menichetti, 2012). Literature on renewable energy sector has paid attention to the business models of solar cells production firms, adopters and electric utilities. For example, Loock (2012) studied the business model preferences of 249 investment managers for renewable energy. He argued that service-centered business models are more favorable among investment managers. One conclusion of this study is that policy makers should support the service-centered businesses instead of the technology or price. Based on the PV sector in Netherlands, Huijben and Verbong (2013) categorize the business model of the adopters as: customer-owned, community shares and third party business models. The authors conclude that entrepreneurial activities to create new business models for PV adoption have positively influenced the market growth in Netherlands. Richter (2013) studies 18 electric utilities in Germany. This study asserts that business model innovation in electric utilities is vital to manage the transition towards renewable energy sources.

3. Methods

The method of this paper is an illustrative case study (Yin, 2003). In general, the aim of using case study method can vary, including providing description, testing theory or generating theory (Eisenhardt, 1989). The case studies should not only address theory, but also provide real world examples in a new way (Siggelkow, 2007). We choose to use a case study method in order to provide an in-depth description of a local solar company. This description is framed through the concept of business model (Chesbrough and Rosenbloom, 2002) and its components (Morris et al., 2005).

As Yin (2011) wrote, a case study approach is appropriate when exploring a contemporary phenomenon and to gain a holistic view of complex instances through observation, and searching for patterns specially when there is lack of previous research. The stimulus for a case study approach (Stake, 2000; Yin, 2011) is to offer understanding and give insights into reality. In our case, it is about a business model challenge of a local solar company in Germany. We are aware of the limitations regarding the generalisation of case studies and recognise that its strength lies in its unique ability to develop “concrete” and “practical” context dependent knowledge that has been empirically collected (Flyvbjerg, 2006; Lincoln and Guba, 2009; Stake, 2000). As Flyvbjerg (2006) suggests, case studies have the ability to provide empirical “real life situations” and provide “multiple wealth of details” and in so doing results in an illustrative context-limited knowledge.

3.1. Empirical setting

The object of our case study is Hartmann Energitechnik GmBH (HET) at zip code 72108[1] in Germany (see Figure 1). It offers not only PV, but also some other technologies: Solar Thermal Systems, Pellet Ovens etc. As show in Figure 2, it is located in a rural area, nearby to a village, Oberndorf in Rottenburg (Am Neckar). It is a local solar company founded in 1995 by a local entrepreneur, Thomas Hartmann, a

[1] Zip codes are used because of comparison reasons with other studies (e.g. Karakaya et al., 2014b)

native of Oberndorf. The HET is also the co-founder of two solar initiatives: Solar-Partner e.V and Sonnenhaus-Institut e.V. The former is a network of companies, freelance solar consultants and partner companies. The latter is an association of architects, engineers and managers of the solar industry, focusing on solar-heated and solar-electrified buildings. The members of both initiatives are from various locations in zip code areas 7 and 8.

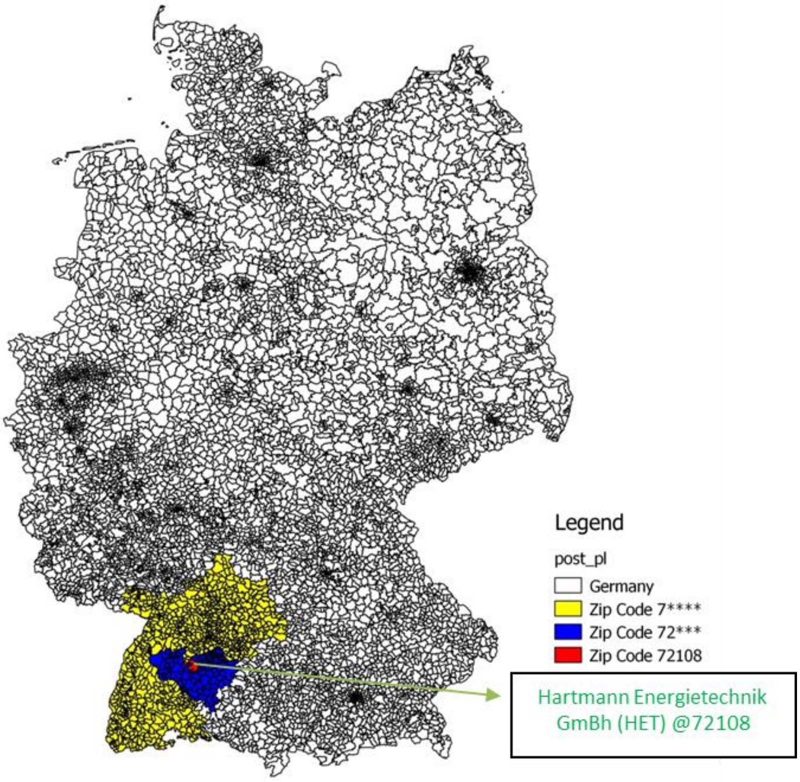

Figure 1- The location of Hartman Energietechnik GmBH (HET) in the zip code map of Germany

Figure 2- The Hartmann Energietechnik and its neighborhood

3.2. Data Collection

The major part of the data was collected between December 2012 and March 2013. The data includes 18 interviews, approximately 600 hour observation and the internal data of the company.

The interviews were conducted with Thomas Hartmann, the employees in the HET, the directors of 4 other partner local solar companies and the PV adopters. The durations of interviews vary between 10 min to 1 hour. The interviews were designed as semi-structured open-end questions. The interviewer has freedom to add new questions, based on the flow of the discussions during interviews. They were conducted in various locations: the company, the houses of adopters and a regional workshop. Except one, the language of the interviews was German. All interviews are electronically recorded.

The main part of the observations took place in the HET for 3 months by one of the authors. During this period, he also lived at the zip code 72108 in Rottenburg am Neckar. The author was present in the company HET for on average of 9 hours/day in weekdays. He acted as a participant observer (Atkinson and Hammersley, 1994) at formal meetings and participated in the informal gatherings of the company. He has monitored several ongoing PV installations projects and has met with the adopters during the installations. He also attended a 2-day regional workshop, organized by Solar-Partner e.V in order to discuss the latest developments in the solar market. The workshop gathered nearly 150 participants from several companies.

The Internal data is composed of various documents and the sales database of the HET. The documents include internal agreements, technical and feasibility reports of each PV installation and the documentation of each project. The database includes the evolution of offers and confirmation of orders for PV installations. The data about other technologies that HET offers, such as Solar Thermal or Pellet Ovens, has been used as complementary in the study.

4. Results and Discussions

The business model of the HET for PV is based on developing projects of PV installations. Such projects start with the declaration of interest by potential adopters, i.e. request of quotation. When a potential adopter, e.g. a householder, declares interest, a representative of the company visits the place on site where the PV is planned to be installed. Depending on the characteristics of the place and the preferences of the potential adopter, e.g. the roof space, the sunshine potential and the budget of the potential adopter, the company HET drafts a project and creates the sales quote (estimate). The sales quote shows what costs would be involved for the prospective PV installation. If the potential adopter agrees on the sales quote, he/she confirms the HET. Based on this confirmation, HET installs the PV on the place as planned. The system components needed for the installation are provided by supplier companies such as, among others, PV module or inverter producers.

4.1. How does the company create value from PV?

PV installation is not a simple task. It is bounded by both adopters’ preferences and the physical availability of the different types of places, e.g. the rooftop, garage, façade or free-land. This means that each householder needs a particular solution for installing the PV. In this context, the company HET creates value from developing projects of PV installations that provides solutions for particular needs. Figure 3 presents some examples that the company HET has installed for various needs in the neighborhood. As discussed by Loock (2012), service-oriented business models are more preferable in renewable energy sector. The case of HET is an example of product/service mix offering.

Figure 3- Different PV solutions for various needs and concepts: a semi-transparent garage roof (left), a roof with shadowy parts (middle) and a flat roof with standing modules (right)

4.2. Who does the company create value for?

The market that HET competes is a business-to-customer (B2C) type. Customers, i.e. potential PV adopters, are local: approximately spread to 50 km radius, instead of being national or international (see Morris et al., 2005). This local area is a part of Swabia, which is a major part of zip code area 7. Swabia suffered from the poverty and scarcity in the 19th Century, which was followed by the industrial uptake in the 20st Century. Nowadays, Swabians are often taken as role models to how to manage the money (The Economist, 2014; The Guardian, 2012). The customers of HET are usually Swabian householders, who have a sufficient space on site to install PV and who are financially stable. These householders speak a special dialect of German, called Swabian, which is also spoken in the HET as internal company language.

4.3. What is the company´s source of competence?

HET's source of competence is composed of several interrelated factors. The first is the fact that the company is led by a local entrepreneur, who knows the local traditions and lifestyle very well. The second is about the visibility of the company. This visibility is driven by complementary social activities that potential adopters can have at the company: such as having a dinner which is cooked by renewable sources; participating in the 3-h solar-walks (to observe the previous projects of the HET) which is held once a month; and having a tour inside the HET on open-door days which is held once a year. The third factor is about the quality of the PV installations, mainly based on German solar modules and inverters. In a nutshell, competence of HET is an intimate-customer type (see Morris et al., 2005).

> "Probably because we are a local company and we have many good reference systems here in the neighborhood, and yes I think we are well known. Plus, the combination of the brand Thomas Hartmann has built (is very important). Solar center and solar walks talk to the feelings; they are not just about purely technical side. This shows off the products. There is a building here. That's always the most important, if one builds a place where people can see. Not every customer care about the purely technical data, but they want to experience (An Engineer in the HET, 31.01.2013) [2]"

[2] The original text in German: Vermutlich weil wir lokale Unternehmen sind, relative viele Referenz Anlage hier in die gegen haben, und ja ich denke dass bekannt ist gerad. Plus, mit die Kombination die Marke die Thomas Hartmann aufbaut hat, sonnen Zentrum, solarspaziergang, dass man Gefühle anspricht, nicht nur reine technische Seite, sondern auch die Produkte vorführt, man hat hier Gebäude gebaut. Das ist doch immer die wichtigste. wenn man Gebäude wo die Leute anschauen können. Nicht jede Kunde spricht auf die rein technische Daten, sondern die wollen das erleben

4.4. How does the company competitively position itself?

> “I received two offers one from Hartmann one from other guy. I did the comparison but I choose the one which was expensive. It is a local installation company, well-known in the region, there are many references in the area, and he is a very well-known guy. Go for the local! (PV Adopter, Mr. M, 21.12.2012)”
>
> He (Thomas Hartmann) is trustworthy. I want crafts come from the local area and we buy German modules, no imports, and for this I am willing to spend more money (PV Adopter, Mr. R., 23.01.2013)[3].”

The HET intends to achieve advantage over competitors, by providing local products with a good quality service. As the HET is pioneer of its kind in the region, i.e. at 72108 and its surroundings, the company has a lot of reference projects that make potential adopters to trust HET in terms of quality of the installations.

> “We had three companies in the race, we asked three. We thought we choose the company that is already well-known, which always works for ideological reasons (environmental reasons). Other companies simply appeared on the market in recent years, they want to sell a lot... All three were regional. We want to buy from our local neighborhood- as much as possible- because you have reliable people here. Many years of experience and highly trained staff were the deciding factors for HET. The HET was the most expensive, but not so much. (PV Adopters, Mrs. W. & Mr. H., 29.01.2013)[4]”

Most of the adopters believe that Thomas Hartman is driven by an ecological idealism and he is a trustworthy entrepreneur. Such trust towards local solar companies is usually associated with green movement, in particular against nuclear power (Dewald and Truffer, 2012: 409). This trust and respect make several potential adopters to choose the company HET, instead of its competitors, those of which have been established just after the support of policy makers on PV through the EEG law in 2000s.

4.5. How does the company make money?

Figure 4 presents a simple scheme of the value network of the HET. In Germany, the policy support is not provided by subsidies but through the EEG surcharge (see Wirth, 2014: 22). Anybody who uses electricity has to pay taxes on the EEG surcharge, which funds the Feed-in-Tariff. As a result, the Feed-in-Tariff pays for adopters, e.g. to whom the HET installed PV, for the electricity generated with fixed feed-in tariffs for the next 20 years from the time the PV is connected. Such guarantee makes potential adopters to be able to pay the high installations costs, which is paid to local solar companies, e.g. the HET. This mechanism is similar to the end-user owned residential type in PV sector in the USA (see Frantzis et al., 2008: 10).

[3] The original text in German:Weil er vertrauenswürdig ist. Ich möchte Handwerke aus den Umgebung kommen und wir deutsche Module kaufen, keine Importe; und da bin ich bereit mehr Geld auszugeben.

[4] The original text in German: Wir hatten drei Firmen im Rennen, wir haben drei gefragt. Wir haben gedacht wir nehmen einfach eine Firma die sich schon gut auskennt, die auf ideologischen gründen immer macht. Andere Firmen sind in den letzten Jahren einfach alle auf dem Boden geschossen, möchten sie viel verkaufen… Alle drei waren regional. Wir wollten gerne so viel es geht von unsere gegen kaufen weil dann man zuverlässige Leute hat. Langjährige Erfahrungen und gut ausgebildete Mitarbeiter gaben den Ausschlag für HET. Firma HET war die teuerste, aber nicht viel…

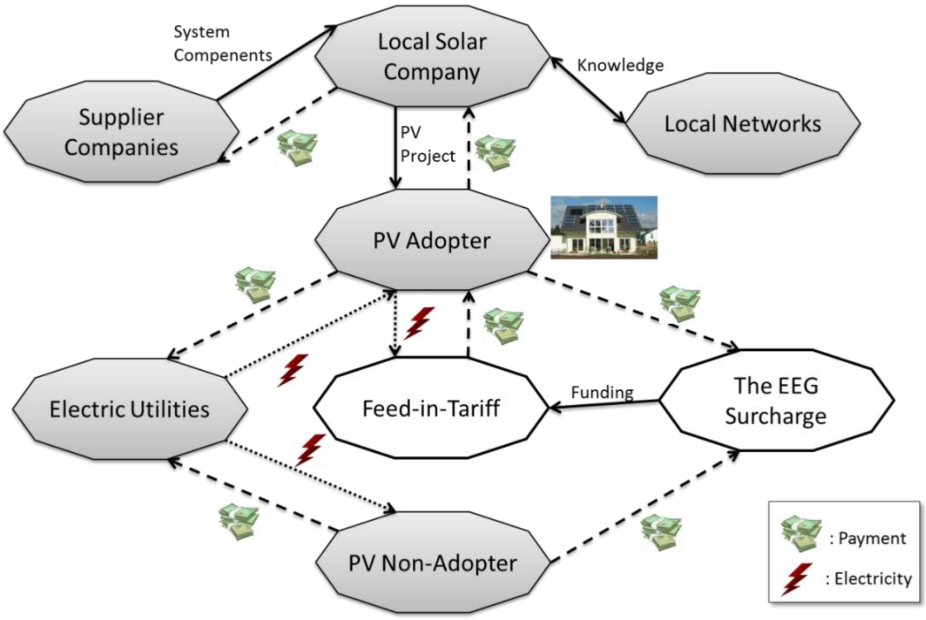

Figure 4- The value network of a local solar company (i.e. HET)

4.6. What are the company´s time, scope, and size ambitious?

Thomas Hartmann invests to the point that the HET is able to generate the stable income, which can be called as income-model according to the Morris et al., (2005). However, the company is local, targeting a market up to 50 km radius and aims to stay as local. This vision to stay local can be associated with two reasons. The first is about the transportation costs of PV. The more the adopter is far from the HET, the more it costs to transport. The second is about one of the competences of Thomas Hartmann: a good knowledge about the potential adopters and his reputation in the neighborhood. The more the potential adopters are far from the HET, the less the company knows about them and the less the company is recognized by them.

4.7. The challenge

The number of yearly PV installations decreased in 2011, 2012 and 2013 at local, regional and national levels in Germany[5]. This decrease can be observed in the sales of the company HET as well. Figure 5 presents this decline in different observation levels. The decrease in number of PV installations is usually interpreted as a result of rapid decline in the Feed-in-Tariff from 2010 to 2012 (see e.g. EPIA, 2014). In spite of such interpretations, it is also assumed that the PV in Germany reached the grid parity by 2012, making the technology advantageous against other conventional sources (Lettner and Auer, 2012). In any case, the decline in number of installations resulted in sharp decrease on the HET´s revenues in 2011 and 2012. This was a challenge because the running costs of the company, such as the costs for human resources needed for engineering and installation, stayed at the same level as before. Figure 7 shows the evolution of HET´s revenues from 2004 to 2012, revealing the decline in the last 2 years.

[5] If the capacity of installations is considered, the decrease happens only in 2012 and 2013.

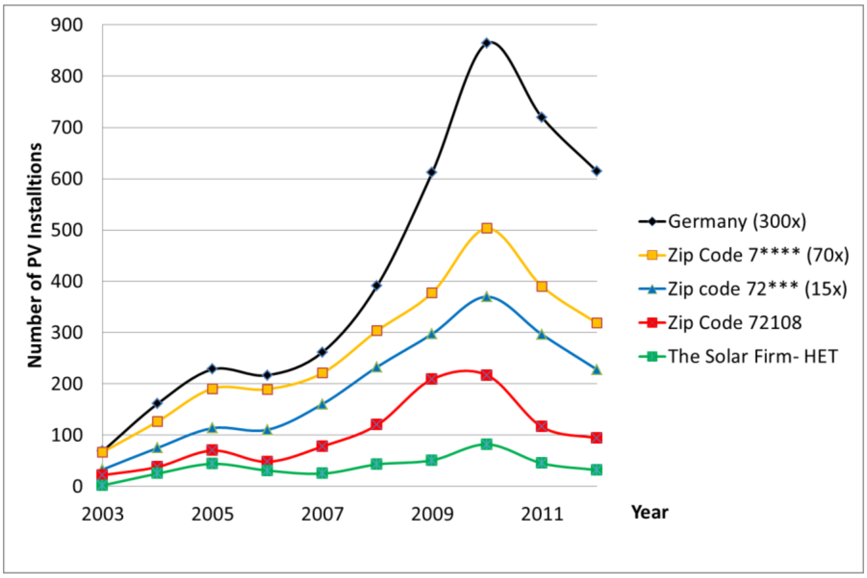

Figure 5- The comparison between diffusions of PV at different levels and the PV that HET installed (Sources: The Information Platform of four German Transmission Network Operators for EEG and KWK-G; and the HET)

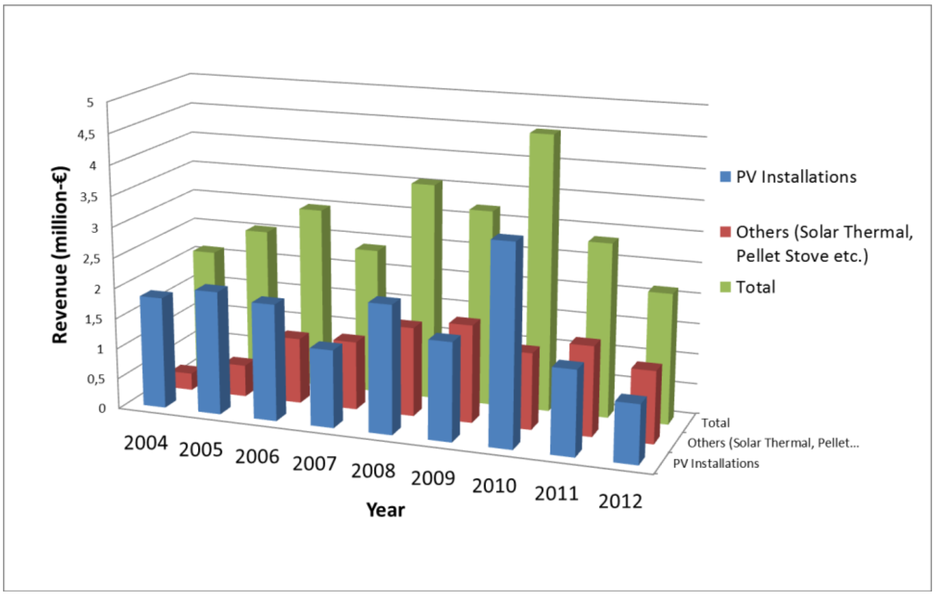

Figure 6- Revenue of HET from PV installations and other services and products[6]

One additional reason for the sharp decline in the revenue of HET is also the decreasing average price of PV installations. For example in 2006, the average price of a PV that the HET installed was around 60000 Euros. This average price decreased to around 30000 Euros in 2012, probably as a result of a learning curve effect (Spence, 1981) on the price of system components such as solar modules (see Nemet, 2006 for other possible reasons beyond learning curve).

[6] The values are approximate.

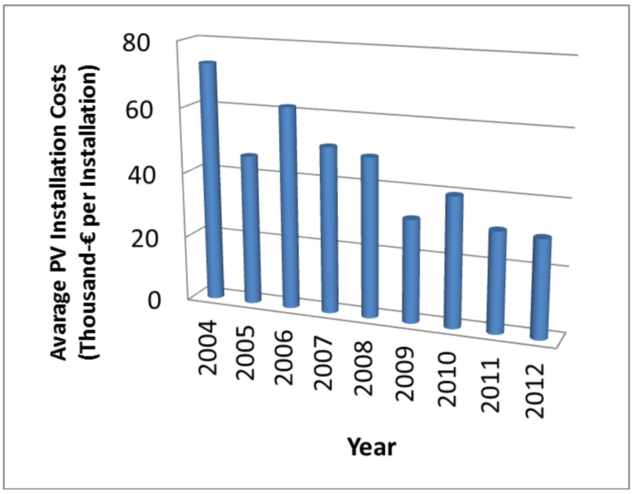

Figure 7- The declining average cost of PV installations[7]

As business model conceptualization considers the process of doing business and explains the challenges in operationalizing the construct (Zott et al., 2011), we also recognize a critical challenge for the HET. Similar to the other actors in renewable energy sector (Wüstenhagen and Menichetti, 2012), the challenge of HET has been bound to the risks and opportunities, which have been created by the policy measures. The challenge does not only lie on the decreasing revenue, but also on the possible strategies to tackle this decrease. In general, such revenue decreases, e.g. which is associated with declining adoption or costs, can be tackled by different strategies such as launching incremental or disruptive innovations in the market (e.g. see Christensen, 1997) or expansion into national and international markets with the existing innovations (see e.g. Beise, 2005; Johanson, 1978). The former strategy is not easy to launch in the case of HET, as the existing adopters are bound to the 20-year lasting EEG support. In addition, these adopters usually do not have extra space left at their houses, e.g. for new types of installations. The latter strategy can be a possible option, but it contradicts with HET´s desire to stay local.

5. Conclusions

Diffusion studies have examined the factors behind adoption at length (Rogers, 2003; Wejnert, 2002). The German case of PV has gained attention and the factors behind it have been discussed from several perspectives (e.g. Jacobsson and Lauber, 2006; Karakaya et al., 2014b). The recent literature has emphasized that the local solar companies are important drivers of diffusion (Dewald and Truffer, 2012; Fabrizio and Hawn, 2013). Extending this debate from a business model perspective (Chesbrough and Rosenbloom, 2002; Morris et al., 2005), this study has presented an illustrative case of a local solar company in Germany, aiming to develop a holistic view of phenomenon as there is lack of previous research on it.

Our study has illustratively described the business model of the local solar company and the challenge it has faced. The challenge occurs at a time when PV diffusions are characterized by three facts: declining policy support, i.e. diminishing feed-in-tariff for PV installations, declining adoption rates and decreasing installation costs. As a result, our case company faces a rapid decrease in its revenue. Expanding its market to the national/international level or coming up with incremental/disruptive innovations could be some options to tackle this challenge. However, the company is reluctant to do either

[7] The values are approximate.

of them due to its existing business model which is based on "being local" and the nature of PV sector. This challenge exemplifies not only how existing business models can hinder new business model (e.g. Sosna et al., 2010) but also how the businesses in energy sector are bound to the policy (Wüstenhagen and Menichetti, 2012).

Our findings are of crucial importance to the actors in renewable energy sector, particularly to the policy makers. If policy makers seek to support the diffusion of environmentally friendly innovations such as PV, they should consider whether the business models of existing local companies will survive. As the policy measures are unlikely to have the expected impact without local solar companies (Dewald and Truffer, 2012; Fabrizio and Hawn, 2013), survival of such companies are critical for enhancing the diffusion of PV. This means that policy makers should consider new measures to support the existing local companies as they are the important drivers of diffusion of PV systems.

Finally, this study is illustrative in nature and has some limitations. For instance, it is only based on a single-case study. However as Flyvbjerg (2006) suggests, it contributes to the collective process of knowledge accumulation in a particular field that lies among Energy, Economics and Management. We believe that our study provides empirical insights and provide multiple wealth of details, which can be used as a basis for future research.

Acknowledgments

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