Carsten Herbes, Susanne Blazejewski, Vasco Brummer, Naomi Gericke, Judith Rognli

The next big thing or too big for us? New business models for renewable energy cooperatives – barriers in the perception of cooperatives' members

Category: Renewables

Keywords: renewable energy, cooperative, community energy, business model

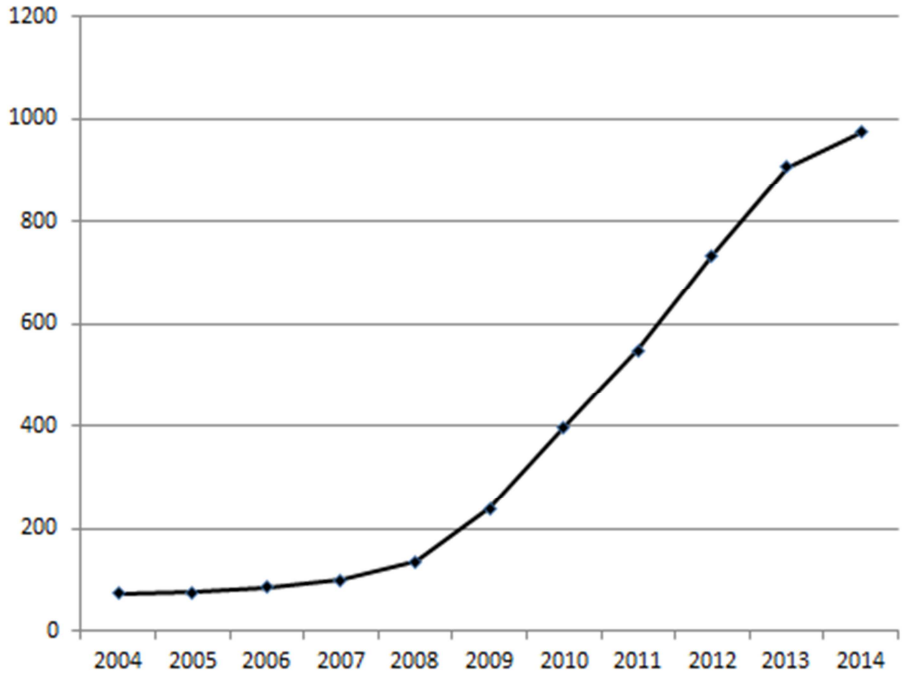
Abstract

Renewable Energy Cooperatives (RECs) in Germany have received much attention in the last years and their number has risen to around thousand within few years. Changes in the German Renewable Energy Act have made photovoltaic systems supported by feed-in-tariffs, the hitherto most popular business model of German RECs mostly unprofitable. RECs are therefore looking for new businesses and envisage a large portfolio of activities from energy generation and retailing to energy-related and other services. Our study aimed at identifying which business models REC members contemplate for their organizations and which barriers they see. We conducted ca. 40 interviews with REC members and 15 non-participant observations of RECs' annual general meetings. Besides other barriers, already identified for incumbent utilities' attempts to realize new renewable energy business models, for RECs the following barriers seem to be important: REC members and management are rather risk-averse and very aware of the risks that new business models entail. Moreover, there are ethical concerns with new businesses, e.g. environmental concerns with wind power or concerns that certain models, although legal, are not in line with what lawmakers intended. A last important barrier is lack of competencies and time of the mostly unsalaried REC management. These barriers could put RECs at a disadvantage in developing new business models but professionalization, partnerships and other strategies can help to overcome them.

1. Introduction

Community energy projects and especially renewable energy cooperatives (RECs) have become an increasingly important element of energy markets in various European countries (Viardot et al. 2013; Bauwens et al. 2016). Especially in the German energy market, they have changed the long unaltered market structure. As of end of 2014, 973 RECs (Holstenkamp, Müller 2015) were operating in Germany with the 772 RECs founded since 2006 alone accounting for a total capacity of approximately one Gigawatt (DGRV 2015).

Figure 1: RECs in Germany



Sources: Holstenkamp, Müller 2015, Klaus Novy Institut 2014

RECS are cooperatives that focus their business on energy from renewable resources. They are often associated with positive effects such as supporting the transition towards a more sustainable energy infrastructure by investing into RE facilities and offering opportunities for participation to citizens in a democratic governance structure where each member has one vote irrespective of their capital stake (Yildiz et al. 2015). Moreover, citizens can become members already with rather small investment amounts , RECs often have a strong link to the region and are said to increase the public acceptance for the energy transition process in Germany (Klagge et al. 2016). And RECs in Germany have

frequently been criticized for the fact that they lack a substantial characteristic of cooperatives: their members are in many cases not customers and only benefit from the REC's activities in the form of dividends because the electricity is fed into the grid in a FIT model in most cases (Klagge et al. 2016).

The main drivers of the fast growth of the REC sector in Germany since 2006 were a favorable feed-in-tariff (FIT) for electricity from renewable resources, especially photovoltaics (Yildiz 2014), based on the German Renewable Energy Act (REA) and a facilitation of the process of establishing a new REC based on the Cooperative Law (Klagge et al. 2016). Moreover, the liberalization of the German energy market (Menges 2003) in the late 1990s was an important prerequisite and in a more historical perspectives, Germans were used to a strong cooperative sector and participating in energy projects since the 19th century (Yildiz 2014; Klagge et al. 2016).

Most RECs so far have relied on an easily scalable, simple and low-risk business model: producing electricity with photovoltaic (PV) systems and receiving FIT stipulated by the German REA (Sagebiel et al. 2014a; Yildiz et al. 2015). More specifically, out of 754 cooperatives in the study by Müller and Holstenkamp, 431 focused on solar energy (Holstenkamp, Müller 2013). In a survey from 2014 (Klagge et al. 2016), nearly 80% of all regional RECs and more than 80% of supra-regional RECs relied on the FIT scheme for their revenue stream. Looking at generation technologies, around 80% of all RECs in the survey relied on PV systems, wind and other technologies were far less popular.

However, two external factors in the past two years had a severe negative impact on this model: reforms of the REA (Klagge et al. 2016; Yildiz 2014) and insecurity about the Capital Investment Act (CIA; German: Kapitalanlagegesetzbuch, KAGB). First, with the reforms of the REA passed in 2013 and 2016, the German government has made PV installations a lot less profitable by considerably lowering the FIT in the REA 2014 (decided in 2013). Moreover, Germany is generally moving from a FIT system with fixed tariffs towards a tendering system. In such a system, prospective producers of renewable energy have to develop projects and bid on a government tender. The government then choses the projects with the lowest production cost. This new system has driven down remuneration levels even further. Moreover, it places a significant risk on the bidders who have to invest large amounts to develop projects without knowing if they will be successful in the bidding process. The latest reform of the REA provides special regulations aiming at lowering the risk for 'citizens' energy projects', among them REC projects (Federal Ministry for Economic Affairs and Energy 2016), but still REC need to develop projects to a certain stage before placing a bid and thus run the risk of losing the investment.

The second factor was insecurity around the German Capital Investment Act (CIA) in 2014 and 2015 (Müller, Holstenkamp 2015). In March 2015, the German Federal Financial Supervisory Authority (BaFin) finally made clear that cooperatives in most cases do not fall under the CIA (BaFin - Federal Financial Supervisory Authority 2015). Before, the BaFin had in their administrative practices deemed that an investment into other companies or cooperatives amounting to more than 10% of the assets of a REC is not in line with the CIA (BBEn 2014). That meant that RECs would have had to go through a cumbersome registration process with the BaFin and, more severely, had to proof that their management had the necessary qualifications for running an investment business. This would have been very difficult to fulfill for the RECs since most of them operate with a non-salaried management without a banking background. The insecurity around the CIA affected plans of RECs to invest into larger projects, e.g. wind parks, not developed and operated by themselves and created an investment backlog in many RECs. RECs contemplated this business model at the time and it was the second most important revenue model of RECs in 2014 (Klagge et al. 2016) since it did not overstretch the RECs resources and risk bearing capacity as autonomous development of a wind park would have done.

Especially these two factors, disruptive changes in the REA and temporary insecurities around the CIA, have driven down the numbers of new establishments in the REC sector in 2014 and 2015. In 2015, only 40 RECs were founded, while the number in 2011 was 167 (DGRV 2016). But it has also made RECs look into new business models.

Other than joint stock companies or many other types of legal entities in the business sector, cooperatives have a democratic decision making model, i.e. each member has one vote regardless of the amount of their investment. The decision on the adoption of a new business model, i.e. business model innovation, is not necessarily in each case to be decided by the cooperative's members in the annual general meeting (AGM). As long as the Articles of Association of the cooperative cover a certain business model in general, the management can proceed without asking members. However, in the RECs we got to know in our research, many REC managers tend to legitimize their decisions on new business models by taking them to the AGM. Moreover, members could replace a management that adopts a business model which is not accepted by the majority of the members. Therefore it is decisive that new business models meet the acceptance of members and management alike. This leads to our two research questions:

1) Which potential business models do members and management contemplate for their REC?
2) How do they judge these business models for their REC, especially: which barriers do they see?

The business model concept is frequently used both in academic research as well as by management practitioners as a classification and visualization tool for companies and their activities (Loock 2012; Richter 2013b; Energieagentur Rheinland-Pfalz GmbH 2016). To help in classifying enterprises, business model concepts usually provide a template with fixed categories such as revenue model, value proposition etc. (Bieger 2011; Hamel 2002; Zott, Amit 2013; Hedman, Kalling 2003), thus enabling comparisons and overviews. In our study, we use the business model concept in order to give a structured overview of RE business models mentioned in the literature (see Table 2), potential new businesses for RECs (see morphology in Table 3) and to structure what our interview partners told us about new businesses for their organization (see Section 3.2). Despite the popularity of the idea, there is no generally accepted definition of a business model and further theoretical development is called for (Zott et al. 2011; Bock et al. 2012). Often cited definitions include those of Osterwalder and Pigneur (Osterwalder, Pigneur 2010) or Osterwalder who defines a business model as "… an abstract conceptual model that represents the business and money earning logic of a company." (Osterwalder 2004: 15) Various business model concepts with different elements have been proposed (Chesbrough 2010, Osterwalder et al. 2005, 2005; Chesbrough, Rosenbloom 2002). Many researchers in the renewable energy area e.g. (Strupeit, Palm 2016; Gabriel, Kirkwood 2016) use a business model structure based on the business model canvas (Osterwalder et al. 2005) with the following or similar elements (see Table 1).

Table 1: Business model elements

<table>
<tr><th>Main elements</th><th rowspan="2">Value proposition</th><th>Customer interface</th><th>Infrastructure</th><th>Revenue model / financial model</th></tr>
<tr><td>Sub-elements</td><td>Target customers / customer segments</td><td>Key activities</td><td>Revenue streams</td></tr>
<tr><td rowspan="3"></td><td>Customer relationships</td><td>Key resources</td><td rowspan="2">Cost structure</td></tr>
<tr><td>Channels</td><td>Key partners</td></tr>
</table>

Source: Osterwalder et al. 2005; Osterwalder, Pigneur 2010; Osterwalder 2004

In the context of sustainability and sustainable innovations, the business model concept is especially relevant (Boons, Lüdeke-Freund 2013) because "[…] the implementation of new business models has been identified as key for […] the diffusion of sustainable innovations […]" (Strupeit, Palm 2016: 125) Moreover, it has proven to be a valuable instrument for analysis in emerging markets such as the markets for renewable energy (Loock 2012). The business model concept was developed and is

mostly used for analyzing for-profit companies organized as corporations. But does this make it unsuitable for the analysis of RECs? We think no, because even fundamental definitions like “The logic of the firm, the way it operate sand how it creates value for its stakeholder” (Baden-Fuller, Morgan 2010: 158) also apply to cooperatives. It is merely the definition of ‘value’ that differs. In cooperatives, value for the members can consist both of dividends or of the opportunity to source energy at attractive prices as well as psychological utility as it is known from buyers of green electricity (Hartmann, Apaolaza-Ibáñez 2012) or “ideological surplus value” (Klagge et al. 2016: 244). Moreover, it can also be the public benefit that provides value (Wüstenhagen, Boehnke 2008).

Business models for renewable energy have received increased attention from researchers and practitioners in the last years, e.g. (Richter 2012, 2013a, 2013b; Aslani, Mohaghar 2013; Behrangrad 2015; San Román et al. 2011; Strupeit, Palm 2016; Klagge et al. 2016) and have been used for categorizing RECs (Holstenkamp 2012). Past research has identified a number of business models in the field of renewable energy, however mostly from the perspective of incumbent utilities. The most frequently mentioned business models are summarized below (Table 2). Business models for renewable energy can be structured along different dimensions, among which resources (e.g. wind power, PV) and activities (e.g. generation, T&D, retail, consumption-related services) are often used (Richter 2013b; Aslani, Mohaghar 2013; Yildiz 2014) as well as ownership of generation equipment (Frantzis et al. 2008).

Table 2: Frequently identified business models for renewable energy

Step in the value chain	Generation and generation-related services	System operation, T&D	Retail	Consumption-related services
Business models mentioned	Financing distributed PV installations for private households (Frantzis et al. 2008; Strupeit, Palm 2016)	Providing balancing services (Behrangrad 2015) e.g. with renewable installations such as biogas	Selling renewable energy with proven pro-environmental effects to customers	Consulting services, e.g. on energy efficiency (Richter 2013b; Yildiz 2014)
	Contracting services, such as installation and operation of PV installations on third party premises, partly with selling the electricity to the premise’s owner (Richter 2013b; Strupeit, Palm 2016)			Demand side management (Richter 2013b; Behrangrad 2015; Hall, Roelich 2016)
	Technical services for			Distributed sto-

	distributed PV systems and product service systems (Frantzis et al. 2008; Strupeit, Palm 2016)			rage, e.g. by using electric vehicles (Richter 2013b; San Román et al. 2011)
				Operating charging points for electric vehicles (San Román et al. 2011)
				Energy efficiency models (Behrangrad 2015)

Looking at the above list, a word of caution is in order. Although authors frequently use the term 'business model' they often refer only to one or few elements of the business model concept. E.g. Yildiz focuses on the way citizens invest money into renewable projects, i.e. on the investment vehicle (Yildiz 2014) and Klagge et al. refer to business models but mainly focus on key resources (location of the RE facilities and investors) as well as revenue streams (Klagge et al. 2016).

Although there is to our knowledge very little academic research on RECs and (new) business models as of now, the last two years have seen a large number of activities by practitioners and associations. There are numerous seminars on the topic and a regional energy agency has published a study on new business models with guidelines for practical application (Energieagentur Rheinland-Pfalz GmbH 2016). Looking at what is happening in practice, the following business model elements seem to be especially relevant for RECs in Germany at the moment (Energieagentur Rheinland-Pfalz GmbH 2016; Klagge et al. 2016):

- Local direct sales of electricity (using certain provisions in the German REA)
- Selling electricity to consumers (RECs as a utility)
- Producing and selling heat to local households
- Energy efficiency
- Contracting
- E-Mobility
- Consulting services
- Real estate and energy management

In order to give an overview on the elements and their potential parameter values in the context of RECs, we have drawn up a preliminary morphology of REC business models (Table 3).

Table 3: Morphology of REC business models

Value proposition	Energy from regional sources	Energy from environmentally friendly sources	Superior service	Cost savings	
Customer segments	Businesses in general	Business who owns the premises on which the RE facility is installed	Consumers in general	REC members	Municipalities
Customer relationship	Simple energy supply relationship	Complex relationship with energy supply and investment linked	Close relationship with comprehensive information exchange		
Channel	Direct	Through aggregators such as Bürgerwerke	Through other retail partners (e.g. local municipalities)		
Key activities	Energy production	T&D	Retail	Services (consulting, contracting etc.)	Investment
Key resources (technical facilities)	PV installations	Wind power installations	Biomass plants	Other renewables	Grid
	Local	Regional	National	International	
Key resources (financing)	Local	Regional	National	International	
Key partners	No partner	Other REC	Municipal utilities	Other utilities	
Revenue stream	Remuneration per kWh	Participation in energy savings	Consulting fees	Dividend payouts	

Source: structure based on Osterwalder et al. 2005

To inform our research especially with regard to potential barriers to the adoption of new business models we can draw on the literature in the field of business model innovation in general and, more specifically, in the field of sustainable business model innovation based on renewable energy. Barriers for business model innovation in general, that have been identified in the past include internal factors such as a lack of awareness, perceptions of disruptive technologies, organizational inertia, culture, conflicts with existing business models and assets, i.e. path dependency as well as cognitive problems in understanding these (Chesbrough 2010; Sosna et al. 2010; Friedrich von den Eichen, Stephan et al. 2015; Bohnsack et al. 2014; Madjdi, Husig 2011). Especially cognitive barriers

have been emphasized: „ … new business model adoption is confronted with multiple barriers, none more significant than managers' cognitive barriers to change." (Dewald, Bowen 2010: 197)

There are a number of studies looking at barriers for business model innovation in the field of renewables. If they analyze the players' perception of business models at all, it is mostly representatives of existing utilities with their large non-renewable infrastructure. Therefore, not all barriers in these studies are relevant for analyzing RECs. The following barriers have been identified to hinder organizations in adopting renewable energy business models:

- Internal barriers:
    - Cognitive barriers (interview partners were still thinking of electricity as a commodity and in terms of economies of scale and failed to develop new value propositions) (Richter 2013b)
    - Lack of profitability, high costs (Richter 2013b; Aslani, Mohaghar 2013; Richter 2013a; Yildiz 2014)
    - Lack of resources / competencies in the organization (e.g. knowledge on markets, capability to handle small distributed projects) (Richter 2013b; Aslani, Mohaghar 2013; Yildiz 2014)
    - Internal competition (renewable installations compete with fossil-fueled legacy equipment of incumbent utilities (Yildiz 2014)
    - Fluctuating generation patterns are not in line with offering base load (Yildiz 2014)
- External barriers:
    - Lack of demand, lack of public awareness of RE (i.e. customers were, in their perception, not asking for new services) (Richter 2013b; Aslani, Mohaghar 2013)
    - Problems with public acceptance of renewables, e.g. NIMBY (Richter 2013a)
    - Lack of clear supportive policies (Aslani, Mohaghar 2013)
    - Underdeveloped technology (Aslani, Mohaghar 2013)
    - Social barriers (Aslani, Mohaghar 2013)
    - Positive externalities (e.g. environmental benefits) cannot be captured as monetary value (Wüstenhagen, Boehnke 2008)

2. Method

Since there is little research on the subject, we applied an exploratory approach. After initial desk research and the analysis of ca. 100 REC websites, we performed a non-participant observation (Quinn Patton 2015) in the annual general meetings of 15 RECs and subsequently conducted 38

qualitative interviews (Witzel, Reiter 2012) with their members and various experts in the field. We regarded semi-structured, qualitative interviews as an appropriate method, since we wanted to get access to the views and subjective logic of our interview partners. All interviews were transcribed (total: more than 2.700 pages) and underwent a qualitative content analysis using MAXQDA (text analysis software) (Krippendorff 2013; Kuckartz 2014). The RECs were selected with a view to creating a large variety, so we chose RECs from bigger cities and rural contexts, small and large RECs, RECs with different business models etc. Our interview partners were members, management team members and members of the supervisory boards of the RECs. The interviews and observations were embedded into a larger research project on conflicts in RECs and the conflicts and decisions on new business models were a part of that. We conducted semi-structured interviews based on a guideline that was open enough to capture the interview partners' subjective realities.

In the analysis phase, we used an iterative approach to develop the category system, using as first level categories broad concepts such as "business model", "evaluation (positive/negative)", "advantages of business model" or "disadvantages of business model". But a large part of the categories was developed inductively out of the interview transcripts and observation protocols.

All interviews as well as the AGMs were conducted in German, the below quotations from the interviews and AGMs are our translations. The abbreviations, e.g. BN05 A2w, identify the interview partner.

3. Results

3.1. New business models mentioned

Our interviewees expressed that the current business model based on PV and FIT was very easy to handle. One of our interviewees summarized the old model as „The most important thing is to have access to the roofs, just throw the installations on top of the roofs. It works by itself" (BN05 A2w). Another stated: "That was the heyday of PV systems, with a high FIT, relatively easy business model. (BN05 A1m).

A dozen of our interviewees expressed the need for new business models, some pointing out that the REC had collected funds from the members and now needed to invest in new projects, since investments had been stalled due to the insecurity around the CIA. One REC manager put it bluntly by simply stating "we have too much cash" (N04 V1m). Another remarked: "Where can we invest? PV

is not so interesting anymore." (N06 V2m) Others had more far-reaching concerns, fearing that if no second business can be developed and no growth can be achieved, the REC would have to close down or merge with another REC.

Frequently managers perceived a fundamental dichotomy: growth vs. stagnation and sometimes also confronted their members with this fundamental choice: “At the last annual general meeting I asked the ‘question of faith’ Do we just maintain what we have? Or should we start properly and go for wind?” (N01 V2m). Another manager said „ […] after one year we draw a line and say, nothing has happened, maybe a merger with another REC. […] There is no point if we just maintain the installations and no other business models are added” (BN05 V1m)

Our interviewees presented us with a surprisingly large and varied portfolio of ideas for future business activities and business models for their RECs. However, both the wording and sometimes answers to our inquiries made clear that many had still a rather vague idea of these models, their prerequisites and consequences. Therefore, the interviewees did not present fully structured business models covering all elements shown in Table 1 and 3. Mostly, they mentioned just one or two elements. So we will structure their ideas according to the elements that were dominant in their respective statements.

3.1.1. Activities

In the field of *energy production*, the interviewees very frequently mentioned wind power which was also a topic in two thirds of all AGMs and less frequently hydropower, heat generation in general and biogas in particular. But they also talked about less developed technologies like micro wind turbines or even exotic options like producing electricity (probably via PV) with big kites. Energy storage was also mentioned just as well as operating a grid (distribution).

Besides operating generation facilities themselves, our interviewees came up with a number of alternative activities related to energy production. *Investments into bigger projects* were most frequently discussed, not only in the interviews but also in more than half of the AGMs. This type of activity would be linked to a revenue stream from dividend payouts instead of FIT or revenues from selling electricity and was regarded as less risky than operating a big project on one’s own. Five interviewees referred to projects of municipal utilities into which their REC could invest.

Another type of key activity mentioned in both interviews and a quarter of the AGMs was to invest into a RE facility and to *lease or rent it to companies or other customers*. In Germany, this can be financially attractive due to the legal framework. Entities consuming electricity that they have

generated themselves ('self-consumption') are exempt from certain levies and surcharges that apply to electricity purchased from third parties. Cases where the consuming entity leases the equipment from a third party can fall under these regulations in certain cases which can make renewables a financially attractive option.

Activities in the field of *energy retail* were also a very frequent subject in our interviews being mentioned in more than half of the interviews and in nine out of fifteen AGMs. Our interviewees were aware of different types of retail activities pertaining to the customer segments which we will describe later.

A frequent subject in the interviews were *services* that RECs could provide in the area of energy efficiency. The activities ranged from consulting companies and municipalities on how to save energy to services related to energy audits analyses that companies are required to submit according to German law. Consulting private households on building insulation was also part of the portfolio. Services were however rarely discussed in the AGMs.

A service closely related to energy efficiency is *contracting* which was also discussed in several interviews. Examples were operating a CHP unit on the site of the customer. Another topic that was very present with our interviewees was operating street lighting for municipalities or renting street lighting equipment to the municipality.

Besides activities closely related to energy, our interviewees proposed a number of activities that are not or only weakly linked to energy issues. E-Mobility related services were one of them: one REC was planning to provide a rental service with a small fleet of electric vehicles. Others thought about establishing an infrastructure for electric bicycles and a third interviewee envisaged a car-sharing service. Another REC had already done a feasibility study for a REC-operated village shop and another thought about operating a telecommunication network. A last activity that came up in the interviews was providing project development services for other RECs.

3.1.2. Customers

With regard to potential customers in energy retailing, some interviewees mentioned offering a green electricity product to a large number of consumers, often with the help of an aggregator. Others thought of the REC's members as customers and others still thought about selling electricity to a business on the roof of which the REC would install a PV facility. In the field of energy efficiency services, our interviewees saw companies, municipalities as well as private households as their prospective customers.

3.1.3. Revenue models

The revenue models mentioned in the interviews were varied and closely related to the activities. For energy retailing, revenues would be from sales per kWh. For energy efficiency services it could be consulting fees or for contracting a part of the energy savings or a rental fee for the equipment. In the case of lease models it would be a leasing fee and for investments in larger projects it would be dividends.

3.1.4. Key resources

The key resources are closely connected to the abovementioned activities. Thus, different systems such as wind power plants and biogas plants were mentioned. But also know-how and time for developing the new models occupied a major place in the interviews and will be presented in the Section on barriers below. In this context, our interviewees frequently stressed that realizing new business models required employing a salaried management and employees. This is a key finding, since it means that our interview partners were challenging a hitherto fundamental feature of German RECs.

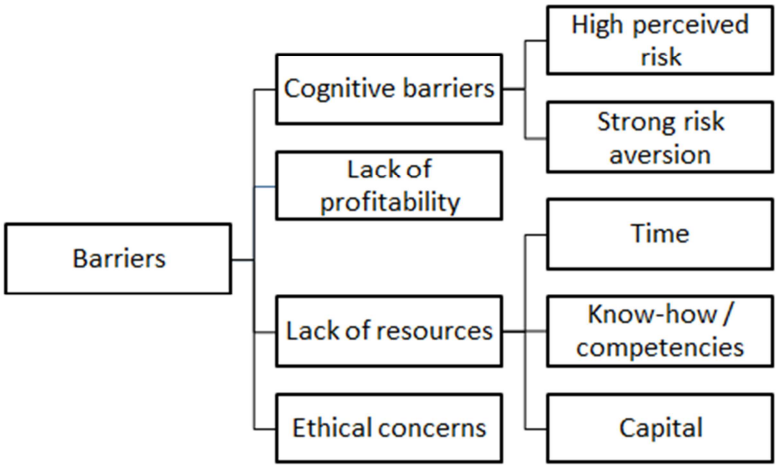
3.1.5. Key partners

Our interviewees were well aware that cooperation with external partners is an important strategy to overcome barriers in implementing new business models. Especially for electricity retailing they mentioned partnering strategies. Other RECs, municipal utilities but also incumbent utilities and project developers were mentioned as potential partners. Especially the Bürgerwerke eG from Heidelberg who act as an aggregator supporting RECs in marketing their electricity to consumers, enjoyed the RECs awareness.

3.2. Barriers

We have structured the barriers (Figure 2) mentioned by our interviewees along the dimensions used for structuring the findings of previous studies in Section 1.

Figure 2: Barriers



3.2.1. Cognitive barriers

We encountered **cognitive barriers** primarily as a high **perceived risk** and a **strong risk aversion** of our interviewees. First, the interviewees had a keen sense of the risks involved in several of the new business models. In the context of operating a wind turbine on one's own as compared to buying a small stake in a wind park, one REC manager remarked: "Rather than buying a wind turbine completely. Firstly that is much more expensive and the risk is bigger." (N01 V1m)

Moreover, members of the management perceived it as their duties to keep their members from risky activities:

> „If a private person does that – no problem. I, as a REC manager am […] answerable to the members and must not invest the money in a risky way." (N07 V1m)
> „The [members] expect that we manage the affairs properly and soundly and do not start project that contain any risks." (N06 V4m)

> "And it is very important, to make no experiments." (BN01 M1m)

Generally, interviewees expressed a strong risk aversion, which also was an impediment to taking out a loan or investing into larger projects. Also in two AGMs (N08, BN03), the management explicitly expressed that they would rather operate on a 100% equity basis.

> "We rather do a smaller number of projects. But on those that we realize, we don't have to pay back loans." (BN03 V1m)

„I can't sleep, if that is not immediately clear." (N01 V1m, in the context of models being legal under the CIA)

One member also voiced the opinion that risks are not in line with the fundamental idea of a cooperative: "I think it is clear to everybody that basically we cannot take financial risks. In a cooperative already due to the legal form." (BN03 M1m)

3.2.2. Lack of profitability

Profitability issues were mentioned, but not very often. For some proposed projects the cash-flow came too late from the members' point of view. Another REC wanted to install PV equipment on a hospital roof and sell the electricity to the hospital but the supervisory board member we talked to doubted that the REC would be able to offer a competitive price to the hospital. For RECs providing district heating, the low oil price influences the competitive position negatively.

3.2.3. Lack of resources

Lack of resources was a far greater concern to REC members and management than profitability issues. The resources mentioned included various categories, first of all time. Most RECs are still managed by volunteers who can only devote a limited amount of time to their REC activities. Therefore our interviewees saw either time constraints or pointed out that additional people would have to be employed to take on new business models or projects: " […] wanted to do contracting or something like that. But if I wanted to do that, I would have to employ somebody" (N01 V1m).

The second category is know-how or competencies. The interviewees acknowledged that many of the new business models required a far greater know-how than the previous model and that the current management would not be up to it, especially if operating on a non-salaried basis: "Well, many [RECs] now start selling green electricity. But other things are too complex to do it with a non-salaried management. Non-salaried management works only for projects which you can realize with relatively little prior knowledge." (BN05 V2m)

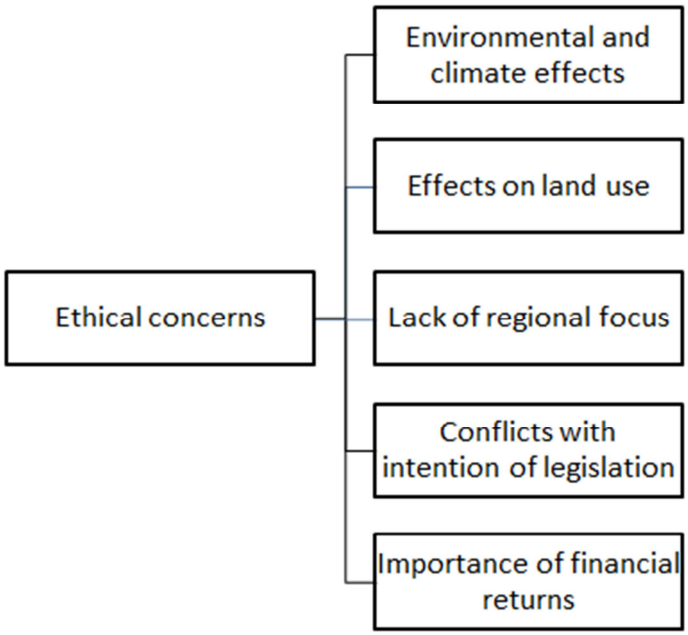
The concerns about know-how were further exacerbated by the insecurity around the CIA. Some RECs were already contemplating a registration with the BaFin which would have required the REC management to proof that they have a professional background in banking which is not the case for most REC managers.

A third category was capital. New business models like investing in a wind park usually required far higher investments than rooftop PV projects and our interviewees felt this would overstretch the financial resources of their organization. In one case it was also the upfront cost for consulting services that were perceived to go beyond the REC's means. Besides the specific barriers in the three abovementioned resource categories, some interview partners also expressed in a more general way that these new models were too complex: "[…] have googled about this [direct marketing] and recognized 'oh my god, that is all terribly complicated, let's drop the whole thing." (N06 TN14m)

3.2.4. Ethical concerns

An internal barrier that had not been mentioned in the literature but played an important role for our interviewees are normative or ethical concerns. These concerns can be structured into several categories: concerns with regard to environmental and climate protection effects, effects on land use (fuel vs. food), lack of regional focus, conflicts with the intention of certain parts of the legislation and finally doubts about the importance of a high financial return (Figure 3).

Figure 3: Categories of ethical concerns



Environmental concerns were raised for several technologies. For hydropower, one interviewee said: "Well, it is clear, fish passes have to be built. […] I am sometimes torn between two things: what is more important: energy transition or nature protection?" (BN05 A2w)

On biogas, there sometimes was outright rejection:“We don’t want that, because it is not quite as bio as it is labeled.“ (N06 AR4w) or members wanted to change the way plants are operating to be more environmentally friendly: „One could simply say [to the farmers]: if you don’t use maize […] you get a few cents more for your electricity or heat. “ (N09 AR3m) Also the fact that biogas plants use energy crops which could be used as food seemed to be a bone of contention in the RECs. With wind, the concerns were about birds and bats being killed and the visual impact on the landscape.

Also retailing of green electricity products met with reservations. Members questioned the climate protection effects of these products which are mostly based on certificates from Scandinavian hydropower and pointed out that these products do not trigger the installation of new RE facilities, even if the REC can generate income from a new green retail product.

While wind parks on the German coast or the marketing of green electricity outside the region were seen as interesting business opportunities, our interviewees sometimes pointed out that they were not linked to the region: “It is important to me […] that the money stays in the region.“ (BN05 M2m) For some of them it was more a normative issue, but sometimes also the REC’s Articles of Association would not allow a participation in such projects.
Rental or lease models in which the REC owns a RE facility and rents it to a third party so that the third party can claim self-consumption under German law met especially harsh critique. Our interviewees pointed out that while such solutions may be legal they were not what the lawmakers wanted. And so they voiced strong opposition:

> „ […] and I say: , I don’t do such models. That is bypassing the will aof the lawmaker. The lawmaker did not want it that way.“ (N01 V2m)
> “We don’t produce anyting, we don’t sell anyging, we have invested money and rent something to somebody. That can be a bit fishy. “ (N09 V1m)

In several contexts, our interview partners pointed out that a high return on investment was not and should not be the primary goal of a REC. For the current business model one interviewee formulated it quite drastically: “ […] it was wrong in my view that you could make a return of more than 10 or 12 percent, at the expense of the consumers. I consider that to be immoral.” (N06 V4m) And the goal of making profits often seems to be limited by ethical boundaries: “ […] we ask ourselves: how can we manage well, have good returns and that in an ethically acceptable dimension.” (BN03 V2m) One supervisory board member was also concerned about the working conditions of migrant workers

installing PV systems in Germany: “We ask our suppliers: show me how you pay your people. […] To say just for the sake of the financial return, he [the migrant labourer] gets 3,50 Euro [per hour] and sleeps in a tent so that my return is 3 percent higher. No, then I don’t want it to be 3 percent higher.” (BN03 A1m)

As for external barriers, the CIA was mentioned several times as putting a legal stop to models that focused on investments in larger projects. Another external barrier was perceived political and public resistance against REC projects in the region and that certain activities would mean getting into competition with municipal utilities. For some technologies, our interviewees had doubts concerning market readiness and efficiency.

3.3. Conflicts around new business models

Given the concerns with new business models voiced by our interviewees it comes as no surprise that new business models were also a conflict topic in some of the AGMs we observed and were also mentioned by our interviewees as existing conflict topics or topics potentially sparking strong conflicts in the future, especially for wind power (expert interview 2, N01 AR1w, N06 V2m, N07 V1m. Existing conflicts were around the question if ecological or financial goals were more important, around hydropower projects that seemed too risky to other members, the reservation about rental or leasing models, the climate effects of green electricity retail and the fundamental question whether to just maintain the status quo or to grow.

4. Discussion

Regarding our first research question (“Which potential business models do members and management contemplate for their REC?”), we have seen that nearly all ‚business models‘ listed in Table 2, which would be key activities in the nomenclature of the business model concept by Osterwalder/Pigneur (Osterwalder, Pigneur 2010) were also envisaged by our interviewees. Technical services, balancing services and demand side management were not mentioned though. Given the fact that our interviews partly took place already in 2014 and publications and seminars for practitioners on business models are abundant at the moment, we can assume that most RECs are aware of a large portfolio of potential models for their future activities. Looking at the vague wording in many interviews and the insecurity expressed by our interviewees, this does not mean, however, that management in all RECs would be able to depict the models in full detail. Further

communication and training by associations, the government and other organizations is necessary to give RECs a clearer picture of potential business models, their prerequisites and implications. Selling renewable electricity to private end customers seems an especially promising option as a new business model. This is because consumers apparently are not only willing to pay a premium for the renewable origin and an extra premium for regional origin but one market segment in their willingness-to-pay additionally values the fact that electricity is produced by a cooperative (Sagebiel et al. 2014b). Moreover, RECs can draw on their members and their social environment for building their customer base. Quite a number of RECs has successfully started this new model, many of them through aggregators such as Bürgerwerke eG. For other players, such as municipal utilities, this means that RECs can be valuable partners in creating a local green electricity brand.

Regarding our second research question, the results of the interviews and non-participant observations were partly surprising. Although cognitive barriers as identified in the literature for incumbent utilities became also visible for the RECs, the nature of those cognitive issues was slightly different. Both, utilities and RECs are clinging to the perceived advantages of their existing business models. For utilities this means that they are still thinking of energy in terms of commodities and economies of scale and have difficulties to come to terms with operating decentralized power systems and following a product differentiation strategy in their marketing. For RECs, and this is new, the main cognitive barrier is lying in their perception of and attitude towards risk. This perception stems from the existing business model, i.e. generating electricity with PV systems and receiving a fixed and guaranteed FIT which was virtually risk-free. In the interviews it became very clear that REC management sees shielding members from risky investments as one of their main duties and that some may even perceive a fundamental contradiction between managing a cooperative and taking risks. RECs did not just perceive risks in new activities like operating a wind power plant but also in leveraging their members' investments by taking out loans. Given the fact that FIT are more and more replaced by tenders with the risk of not being selected and that real marketing of energy becomes increasingly important, this attitude towards risk can become a serious impediment for further growth in the REC sector in Germany. Most of the new activities come with an inherent risk. Of course, a good REC management has to be aware of those risks and has to manage them actively, but refusing risky activities across the board will minimize if not render impossible further growth. Many RECs have in the meanwhile also bought D&O insurance for their management to mitigate the personal risk of their management team.

Lack of profitability was a perceived barrier that utilities and RECs are sharing. Lack of resources is a shared concern as well, although with a different notion in both types of organizations. The utilities in Richter's study (Richter 2013b) mostly referred to a lack of competencies. While competencies

were also an issue for them, the RECs furthermore were worried about the additional time that would have to be committed to the development of new businesses and the capital that would have to be raised. Both items were not a concern for incumbent utilities. Issues with time are linked to the fact that most RECs are still managed on a voluntary basis and therefore managers can only allot a limited amount of time to these activities. Therefore interviewees often mentioned in the same breath that new business models or activities would require salaried full-time managers and employees. The fact that capital was a concern is quite understandable since the PV projects of most RECs are rather small with total investment amounts being EUR 2.2m on average for all RECs in Germany and ca. 40% of the RECs having invested less than EUR 0.5 m (DGRV 2016). This, combined with an aversion against financial leveraging makes the RECs see financial constraints regarding the realization of larger projects such as wind parks. Especially lacks in the first two resource categories, i.e. competencies and time, from our view clearly call for a professionalization of RECs and REC management. Professionalization has also been mentioned by several other studies (e.g. Klagge et al. 2016). A number of RECs have already found ways of professionalization and expanded their resources. A first option is to switch from a non-salaried to a salaried management and also take on employees in administrative functions so that the management can concentrate on strategy and leadership. This could be called 'internal resource expansion'. A second option are cooperations or partnerships with other organizations. Richter already proposed external cooperations as a means for utilities to overcome their constraints when implementing new RE business models (Richter 2013b). A survey from 2014 finds that nearly 40% of regional RECs and more than 60% of supra-regional RECs have cooperations of some sort. For regional RECs, the partners were mostly farmers for producing heat from biomass and for supra-regional RECs it was mostly municipal utilities (Klagge et al. 2016). For selling green energy, a cooperation with an aggregator that takes over the administrative processes and partly also the marketing seems especially promising. The "Bürgerwerke" in Heidelberg/Germany as a 'cooperative of cooperatives' is already selling the electricity of around 60 RECs to a broad customer base (Buergerwerke eG 2016). Other potential partners are banks, housing cooperatives and municipal utilities (Klagge et al. 2016).

Internal competition and the fluctuating generation patterns were not a topic in our interviews, since RECs do not have a fossil legacy infrastructure. But a new barrier, hitherto not mentioned in the literature, became visible in the interviews: ethical concerns. This seems to be a major difference between RECs and incumbent utilities, Richter mentions no ethical concerns by utilities in his study (Richter 2013a). In the statements in our interviews and the discussions we observed in the AGMs various categories of ethical concerns became visible. First of all, environmental effects of certain types of new activities, especially wind power and biogas, although they could be interesting options

from a financial perspective. This, however, is in line with the results of a survey by Holstenkamp and Kahla who found that nature conservation is the second most important investment motive of REC members, only shortly behind supporting the energy transition (Holstenkamp, Kahla 2016). This environmental goal is combined with widespread reservations against biogas, especially the use of energy crops in Germany (Herbes et al. 2014) and, to a far lesser extent, with reservations against wind power (Pohl et al. 2012; Sunak, Madlener 2016).

Another ethical concern was that projects outside the region were not what a REC should do and again we find a link to the investment motives of REC members in Germany as analyzed by Holstenkamp and Kahla: the generation of regional added value was the third most important investment motive in their study (Holstenkamp, Kahla 2016).

But our interviewees also partly rejected rental or lease models combined with self-consumption by the lessee. They thought such models were not in line with the intention of the law although they have been realized many times and are, given certain preconditions, perfectly legal. This points to rather high ethical demands these REC members set to themselves and their REC that clearly go beyond abiding by the law. Moreover, some members also seem to reject returns on investment that are 'too high' from their point of view. This is in line with research on REC members' investment motives which has identified the financial return as significantly less important than in other legal forms of investments in the renewable sector (Degenhart, Nestle 2014).

Ethical concerns are a double-edged sword from our perspective: they can become another major impediment for REC growth in the future but also contribute to REC growth. Of course, if members cannot agree to certain technologies like wind power, this will exclude the REC from a large part of growth options. But a scrupulous approach that tries to minimize the potential negative environmental impact and shies away from models that could seem suspicious to members and outsiders can also strengthen the RECs pro-environmental reputation which in turn can translate into a higher credibility and attractiveness of e.g. green electricity products offered by the REC. For REC management, the awareness of potential ethical concerns as demonstrated in this study can help to prepare and present decisions on new business models in a way that secures maximum member support. Some of the RECs in our study were successful in mitigating potential conflicts on these issues by conducting workshops with their members on strategy and mission statement, partly with external facilitators.

External barriers as listed in Section 1 were not a frequent topic of our interviewees except for the REA and the CIA. Other than the incumbent utilities, REC members do not seem to question the demand for green energy products.

5. Conclusion and outlook

Given the constraints and barriers for implementing new business models and the relatively small size of many German RECs, there are a number of potential strategies that we see for them and that can partly already be observed in the market. To start with the least pleasant options, RECs can decide and some have already done so to discontinue their business. Caught between the problem of subcritical size and the barriers to implementing new business models, some RECs have been dissolved and sold their assets. Others do not grow but focus on managing the existing assets (stagnation) with the existing structure, i.e. in most cases non-salaried management. A third option, especially for RECs of subcritical size is to merge with another, potentially a larger REC. Two sub-options of this strategy could be witnessed in the market recently: First, a formal merger with all the legal requirements it brings. In the second case, one REC sells its assets to the other, is subsequently dissolved and its members become new members of the other REC. We will probably see dissolutions and rescue mergers of more RECS in the years to come.

But we have also identified options that enable further growth: first, internal professionalization by employing a salaried management and staff and second, cooperation with external partners. Both were discussed in more detail in the previous Section.

In order to identify promising business models for themselves, each REC needs to make itself aware of its specific strengths. We see above all the strong local roots and local knowledge as well as access to capital that comes with a relatively low expected return from the members' side as typical REC strengths. The latter, however, has lost part of its relevance in the current low-interest phase. Especially the strong local support and consumers' sympathies and ensuing higher willingness-to-pay for green energy from RECS combined with a partnering strategy with an aggregator who takes care of customer administration seem to be a promising model for RECs from our point of view. The intimate knowledge of the region can be leveraged in project development when it is decisive to garner support from the local population as well as from authorities and political decision makers on the local and regional level. Thus, RECs can be valuable partners for professional project developers from outside the region.

In order to implement new business models, the RECS will have to tackle the three major barriers identified in the Results Section: Lack of resources, strong risk aversion, especially in the attitude of REC management teams and ethical concerns. While risk aversion and ethical concerns have their merits, keeping RECs aloof from overly risky projects and strengthening their pro-environmental and pro-social reputation, they can also become an impediment for further growth. REC management teams will have to devise strategies for handling these two issues. Government can support RECs in this process by mitigating, as already partly foreseen, some of the risks of the new tendering model under the German REA and by providing platforms and support for a further professionalization and partnering activities of RECs. Our results also can help other players such as municipal utilities who aim at a partnership with a REC in crafting suitable cooperation strategies. The results on RECs strong risk aversion and ethical concerns can help to pick the right projects for a cooperation with an REC and the findings on the perceived lack of resources can help to calibrate expectations to what the REC's management can accomplish in a partnership.

Our approach was based on qualitative interviews and observations and aimed at identifying barriers to new business models in RECs for the first time. Therefore, our goal was not to provide quantitative data such as relative frequencies which would provide information on the importance of e.g. barriers. Secondly, our goal was not to provide in depth case studies. Taking into account that perceptions of risk may have very different implications for different RECs, promising results could be generated through an in depth analysis of the way individual RECs approach risk and the implications this has for the development of new business models.

The relative importance of some of our findings may change when carrying out a quantitative survey of a larger number of RECs. Building on our results, it would therefore be promising to use the categories we derived in a quantitative survey. Such a survey could also help to understand better which sociodemographic or psychographic variables, such as environmental awareness influence members' attitudes towards new business models. Moreover, a differentiation on the organizational level would be interesting. RECs are by no means a homogenous phenomenon and their members' investment motives can vary between different types of RECs (Holstenkamp, Kahla 2016).

References

Aslani, Alireza; Mohaghar, Ali (2013): Business structure in renewable energy industry: Key areas. In *Renewable & Sustainable Energy Reviews* 27, pp. 569–575.

Baden-Fuller, Charles; Morgan, Mary S. (2010): Business Models as Models. In *Long Range Planning* 43 (2/3), pp. 156–171.

BaFin - Federal Financial Supervisory Authority (2015): Auslegungsschreiben zum Anwendungsbereich des KAGB und zum Begriff des "Investmentvermögens". Available online at http://www.bafin.de/SharedDocs/Veroeffentlichungen/DE/Auslegungsentscheidung/WA/ae_130614_Anwendungsber_KAGB_begriff_invvermoegen.html, updated on 3/9/2015, checked on 19.07.2016.

Bauwens, Thomas; Gotchev, Boris; Holstenkamp, Lars (2016): What drives the development of community energy in Europe? The case of wind power cooperatives. In *Energy Research & Social Science* 13, pp. 136–147. DOI: 10.1016/j.erss.2015.12.016.

BBEn (2014): Praktische Auswirkungen des KAGB auf Bürgerenergiegenossenschaften. Analyse und Forderungen des Bündnis Bürgerenergie e.V. (BBEn). Available online at https://www.buendnis-buergerenergie.de/fileadmin/user_upload/downloads/Studien/Studie_Praktische_Auswirkungen_des_KAGB_auf_Buergerenergiegenossenschaften_20.02.2015.pdf, checked on 7/19/2016.

Behrangrad, Mahdi (2015): A review of demand side management business models in the electricity market. In *Renewable & Sustainable Energy Reviews* 47, pp. 270–283.

Bieger, T. (2011): Innovative Geschäftsmodelle: Konzeptionelle Grundlagen, Gestaltungsfelder und unternehmerische Praxis. Academic network. Berlin [u.a.]: Springer.

Bock, Adam J.; Opsahl, Tore; George, Gerard; Gann, David M. (2012): The Effects of Culture and Structure on Strategic Flexibility during Business Model Innovation. In *Journal of Management Studies* 49 (2), pp. 279–305.

Bohnsack, Rene; Pinkse, Jonatan; Kolk, Ans (2014): Business Models for Sustainable Technologies: Exploring Business Model Evolution in the Case of Electric Vehicles. In *Research Policy* 43 (2), pp. 284–300.

Boons, Frank; Lüdeke-Freund, Florian (2013): Business models for sustainable innovation: state-of-the-art and steps towards a research agenda. In *Journal of Cleaner Production* 45, pp. 9–19.

Buergerwerke eG (2016): Ein starkes Netzwerk von Energiebürgern. Die Genossenschaften. Available online at https://buergerwerke.de/strom-beziehen/die-buergerwerke/die-genossenschaften/, checked on 7/25/2016.

Chesbrough, Henry (2010): Business Model Innovation: Opportunities and Barriers. In *Long Range Planning* 43 (2/3), pp. 354–363.

Chesbrough, Henry; Rosenbloom, Richard S. (2002): The Role of the Business Model in Capturing Value from Innovation: Evidence from Xerox Corporation's Technology Spin-Off Companies. In *Industrial and Corporate Change* 11 (3), pp. 529–555.

Degenhart, Heinrich; Nestle, Uwe (2014): Studie: Marktrealität von Bürgerenergie und mögliche Auswirkungen von regulatorischen Eingriffen. Lüneburg. Available online at http://www.bund.net/fileadmin/bundnet/pdfs/klima_und_energie/140407_bund_klima_energie_buergerenergie_studie.pdf, checked on 8/15/2016.

Dewald, Jim; Bowen, Frances (2010): Storm Clouds and Silver Linings: Responding to Disruptive Innovations Through Cognitive Resilience. In *Entrepreneurship: Theory & Practice* 34 (1), pp. 197–218.

DGRV (2015): Energiegenossenschaften. Ergebnisse der DGRV-Jahresumfrage (zum 31.12.2014), checked on 2/29/2016.

DGRV (2016): Energiegenossenschaften. Ergebnisse der DGRV-Jahresumfrage (zum 31.12.2015). Available online at http://www.genossenschaften.de/sites/default/files/Auswertung%20Jahresumfrage.pdf, checked on 7/21/2016.

Energieagentur Rheinland-Pfalz GmbH (2016): Geschäftsmodelle für Bürger-Energiegenossenschaften. Markterfassung und Zukunftsperspektiven. Kaiserslautern. Available online at http://www.energiegenossenschaften-gruenden.de/fileadmin/user_upload/Newsletter-Anhaenge/2016_Newsletter_Februar/Buergerenergiegenossenschaften_Broschuere_160210_Small.pdf, checked on 7/22/2016.

Federal Ministry for Economic Affairs and Energy (2016): Akteursvielfalt/Bürgerenergie. Available online at http://www.erneuerbare-energien.de/EE/Redaktion/DE/Standardartikel/marktanalysen-buergerenergie.html, checked on 7/21/2016.

Frantzis, L.; Graham, S.; Katofsky, R.; Sawyer, H. (2008): Photovoltaics Business Models. Subcontract ReportNREL/SR-581-42304. Available online at http://www.nrel.gov/docs/fy08osti/42304.pdf, checked on 7/21/2016.

Friedrich von den Eichen, Stephan; Freiling, Jörg; Matzler, Kurt (2015): Why business model innovations fail. In *Journal of Business Strategy* 36 (6), pp. 29–38.

Gabriel, Cle-Anne; Kirkwood, Jodyanne (2016): Business models for model businesses: Lessons from renewable energy entrepreneurs in developing countries. In *Energy Policy* 95, pp. 336–349.

Hall, Stephen; Roelich, Katy (2016): Business model innovation in electricity supply markets: The role of complex value in the United Kingdom. In *Energy Policy* 92, pp. 286–298.

Hamel, G. (2002): Leading the revolution: How to thrive in turbulent times by making innovation a way of life. New York: Plume Book.

Hartmann, Patrick; Apaolaza-Ibáñez, Vanessa (2012): Consumer attitude and purchase intention toward green energy brands: The roles of psychological benefits and environmental concern. In *Journal of Business Research* 65 (9), pp. 1254–1263.

Hedman, Jonas; Kalling, Thomas (2003): The business model concept: theoretical underpinnings and empirical illustrations. In *European Journal of Information Systems* 12 (1), p. 49.

Herbes, Carsten; Jirka, Eva; Braun, Jan Philipp; Pukall, Klaus (2014): Der gesellschaftliche Diskurs um den ,,Maisdeckel“ vor und nach der Novelle des Erneuerbare-Energien-Gesetzes (EEG) 2012The Social Discourse on the “Maize Cap“ before and after the 2012 Amendment of the German Renewable Energies Act (EEG). In *GAIA - Ecological Perspectives for Science and Society* 23 (2), pp. 100–108. DOI: 10.14512/gaia.23.2.7.

Holstenkamp, Lars (2012): Ansätze einer Systematisierung von Energiegenossenschaften. Approaches towards a Systematization of EnergyCo-operatives. Leuphana Universität. Lüneburg (Arbeitspapierreihe Wirtschaft & Recht, 11). Available online at

http://www.leuphana.de/fileadmin/user_upload/Forschungseinrichtungen/professuren/finanzierung-finanzwirtschaft/files/Arbeitspapiere/typ-energiegeno_120629.pdf, checked on 7/21/2016.

Holstenkamp, Lars; Kahla, Franziska (2016): What are community energy companies trying to accomplish? An empirical investigation of investment motives in the German case. In *Energy Policy* 97, pp. 112–122. DOI: 10.1016/j.enpol.2016.07.010.

Holstenkamp, Lars; Müller, Jakob R. (2013): On the State of Energy Cooperatives in Germany. A Statistical Overview As of 31 December 2012. Edited by Leuphana Universität Lüneburg (Working Paper Series in Business and Law, 14). Available online at http://www.leuphana.de/fileadmin/user_upload/PERSONALPAGES/_ijkl/janner_steve/Homepage_Master/wpbl_14.pdf, checked on 7/28/2016.

Holstenkamp, Lars; Müller, Jakob R. (2015): Zum Stand von Energiegenossenschaften. Aktualisierter Überblick über Zahlen und Entwicklungen zum 31.12.2014. Leuphana Universität Lüneburg. Lüneburg (Arbeitspapiere Wirtschaft & Recht, 20), checked on 2/29/2016.

Klagge, Britta; Schmole, Hanna; Seidl, Irmi; Schön, Susanne (2016): Future of German energy co-operatives. In *Raumforschung und Raumordnung* 74 (3), pp. 243–258. DOI: 10.1007/s13147-016-0398-3.

Krippendorff, Klaus (2013): Content Analysis. An Introduction to Its Methodology. Third Edition. London: Sage.

Kuckartz, Udo (2014): Qualitative Text Analysis. A Guide to Methods, Practice and Using Software. London: Sage.

Laukkanen, Minttu; Patala, Samuli (2014): Analyzing barriers to sustainable business model innovations: innovation systems approach. In *International Journal of Innovation Management* 18 (6), p. 1.

Loock, Moritz (2012): Going beyond best technology and lowest price: on renewable energy investors' preference for service-driven business models. In *Energy Policy* 40, pp. 21–27.

Madjdi, Farsan; Husig, Stefan (2011): The Heterogeneity of Incumbents' Perceptions and Response Strategies in the Face of Potential Disruptions. In *Foresight* 13 (5), pp. 14–33.

Menges, Roland (2003): Supporting renewable energy on liberalised markets: green electricity between additionality and consumer sovereignty. In *Energy Policy* 31 (7), p. 583.

Müller, Jakob R.; Holstenkamp, Lars (2015): Zum Stand von Energiegenossenschaften 2014. Aktualisierter Überblick über Zahlen und Entwicklungen zum 31.12.2014. Available online at https://www.buendnis-buergerenergie.de/fileadmin/user_upload/downloads/Studien/Studie_Zum_Stand_von_Energiegenossenschaften_in_Deutschland_Leuphana.pdf, checked on 7/22/2016.

Osterwalder, Alexander (2004): The business model ontology: a proposition in a design science approach. These pour l'obtention du grade de Docteur en Informatique de Gestion. l'Université de Lausanne, Lausanne. Ecole des hautes études commerciales. Available online at http://www.uniempre.org.br/user-files/files/TheBusiness-Model-Ontology.pdf, checked on 8/5/2016.

Osterwalder, Alexander; Pigneur, Yves (2010): Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. Hoboken, New Jersey: John Wiley & Sons.

Osterwalder, Alexander; Pigneur, Yves; Tucci, Christopher L. (2005): Clarifying Business Models: Origins, Present, and Future of the Concept. In *Communications of the Association for Information Systems* 16 (1), pp. 1–28. Available online at http://aisel.aisnet.org/cgi/viewcontent.cgi?article=3016&context=cais, checked on 7/22/2016.

Pohl, Johannes; Hübner, Gundula; Mohs, Anja (2012): Acceptance and stress effects of aircraft obstruction markings of wind turbines. In *Energy Policy* 50, pp. 592–600.

Porter, Michael E. (1985): Competitive Advantage: Creating and Sustaining Superior Performance. New York: Free Press.

Prahalad, C.K. and Hamel, G. (1990): The core competence of the corporation. In *Harvard Business Review* 68 (3), pp. 79–91.

Quinn Patton, Michael (2015): Qualitative Research & Evaluation Methods. Integrating Theory and Practice. Fourth Edition. Los Angeles et al.: Sage.

Richter, Mario (2012): Utilities' business models for renewable energy: A review. In *Renewable & Sustainable Energy Reviews* 16 (5), pp. 2483–2493.

Richter, Mario (2013a): Business Model Innovation for Sustainable Energy: German Utilities and Renewable Energy. In *Energy Policy* 62, pp. 1226–1237.

Richter, Mario (2013b): German utilities and distributed PV: How to overcome barriers to business model innovation. In *Renewable Energy: An International Journal* 55, pp. 456–466.

Sagebiel, Julian; Müller, Jakob R.; Rommel, Jens (2014a): Are consumers willing to pay more for electricity from cooperatives? Results from an online Choice Experiment in Germany. In *Energy Research & Social Science* 2, pp. 90–101. DOI: 10.1016/j.erss.2014.04.003.

Sagebiel, Julian; Müller, Jakob R.; Rommel, Jens (2014b): Are consumers willing to pay more for electricity from cooperatives? Results from an online Choice Experiment in Germany. In *Energy Research & Social Science* 2, pp. 90–101. DOI: 10.1016/j.erss.2014.04.003.

San Román, Tomás Gómez; Momber, Ilan; Abbad, Michel Rivier; Sánchez Miralles, Álvaro (2011): Regulatory framework and business models for charging plug-in electric vehicles: Infrastructure, agents, and commercial relationships. In *Energy Policy* 39 (10), pp. 6360–6375.

Schaltegger, Stefan; Hansen, Erik G.; Lüdeke-Freund, Florian (2016): Business Models for Sustainability. In *Organization & Environment* 29, 1/1/2016 (1), pp. 3–10.

Sosna, Marc; Trevinyo-Rodríguez, Rosa Nelly; Velamuri, S. Ramakrishna (2010): Business Model Innovation through Trial-and-Error Learning: The Naturhouse Case. In *Long Range Planning* 43 (2/3), pp. 383–407.

Strupeit, Lars; Palm, Alvar (2016): Overcoming barriers to renewable energy diffusion: business models for customer-sited solar photovoltaics in Japan, Germany and the United States. In *Journal of Cleaner Production* 123, pp. 124–136.

Sunak, Yasin; Madlener, Reinhard (2016): The impact of wind farm visibility on property values: A spatial difference-in-differences analysis. In *Energy Economics* 55, pp. 79–91.

Viardot, Eric; Wierenga, Todd; Friedrich, Bernhard (2013): The role of cooperatives in overcoming the barriers to adoption of renewable energy. In *Energy Policy* 63, pp. 756–764. DOI: 10.1016/j.enpol.2013.08.034.

Witzel, Andreas; Reiter, Herwig (2012): The Problem-Centered Interview. London et al.: Sage.

Wüstenhagen, R.; Boehnke, J. (2008): Business models for sustainable energy. In A. Tukker, M. M. Andersen (Eds.): Perspectives on Radical Changes to Sustainable Consumption and Production. Sheffield: Greenleaf Publishing.

Yildiz, Özgür (2014): Financing renewable energy infrastructures via financial citizen participation – The case of Germany. In *Renewable Energy: An International Journal* 68, pp. 677–685.

Yildiz, Özgür; Rommel, Jens; Debor, Sarah; Holstenkamp, Lars; Mey, Franziska; Müller, Jakob R. et al. (2015): Renewable energy cooperatives as gatekeepers or facilitators? Recent developments in Germany and a multidisciplinary research agenda. In *Energy Research & Social Science* 6, pp. 59–73. DOI: 10.1016/j.erss.2014.12.001.

Zott, Christoph; Amit, Raphael (2013): The business model: A theoretically anchored robust construct for strategic analysis. In *Strategic Organization* 11 (4), pp. 403–411.

Zott, Christoph; Amit, Raphael; Massa, Lorenzo (2011): The Business Model: Recent Developments and Future Research. In *Journal of Management* 37 (4), pp. 1019–1042.