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Responding to policy change: New business models for renewable energy cooperatives – Barriers perceived by cooperatives' members

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ABSTRACT

Renewable Energy Cooperatives (RECs) in Germany have received considerable attention in recent years, their number having risen to nearly a thousand since 2004. This growth has resulted largely from Germany's feed-in tariff system. Recent changes in this policy, however, have made the previous REC business models mostly unprofitable, so RECs are looking for new business models. Our study aims at identifying those new models and characterizing the implementation barriers RECs face. To this end, we interviewed REC members and management and observed REC annual general meetings. We found three significant barriers: first, risk aversion on the part of both members and management; second, concerns about the environmental impacts or the ethics of certain models that, while legal, are not felt to align with the intentions of lawmakers; finally, the lack of competencies and time of the mostly unsalaried REC management. These barriers could put the future of RECs at risk, and so threaten the contributions RECs make to the German Energy Transition. Professionalization, partnerships and other strategies can help mitigate this risk. If RECs are to continue to play an important role in the energy transition, policy makers would be wise to consider measures to support their continued growth.

1. Introduction

Community energy projects, especially renewable energy cooperatives (RECs), have become an increasingly important element of energy markets in many European countries (Viardot et al., 2013; Bauwens et al., 2016). In Germany, they have changed the long-unaltered structure of the energy market by adding a new type of player. By the end of 2014, 973 RECs (Müller and Holstenkamp, 2015) were operating in Germany (Fig. 1), with the renewable energy facilities of the 772 RECs founded since 2006 alone accounting for a total electrical capacity of approximately one Gigawatt (DGRV, 2015).[1]

RECs focus their business on energy from renewable resources. As such, they contribute to the transition to a more sustainable energy infrastructure. Because of their egalitarian governance structure, where all members have one vote regardless of the size of their investment (Yildiz et al., 2015), RECs offer opportunities for democratic governance of renewables while providing economic payback to the investing communities. They often have strong regional ties and in Germany are said to increase public acceptance of the energy transition (Klagge et al., 2016).

German energy policy has played a key role in driving growth in the REC sector. First, the German Renewable Energy Act (REA) established a favorable feed-in-tariff (F.I.T.) for electricity from renewable resources, especially from photovoltaics (Yildiz, 2014). Second, the German Cooperative Law facilitated the process of establishing a new REC (Volz, 2012; Klagge et al., 2016). Finally, the liberalization of the German energy market in the late 1990s made an important contribution (Menges, 2003). Recently, the German government has provided special regulation for RECs to participate more easily in auctions for wind power, a means to achieve the promulgated goal of keeping a diversity of actors (Federal Ministry for Economic Affairs and Energy, 2016).

Most RECs have relied on an easily scalable, simple and low-risk business model where they produce electricity via photovoltaic (PV) systems and receive the F.I.T. stipulated by the German REA (Yildiz et al., 2015; Sagebiel et al., 2014). To put this in perspective, of 754 cooperatives in the study by Holstenkamp and Müller (2013), 431 focused on solar energy. A survey from 2014 (Klagge et al., 2016) showed that nearly 80% of all regional RECs and more than 80% of

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[1] The figures by Holstenkamp / Müller and DGRV are not fully comparable.

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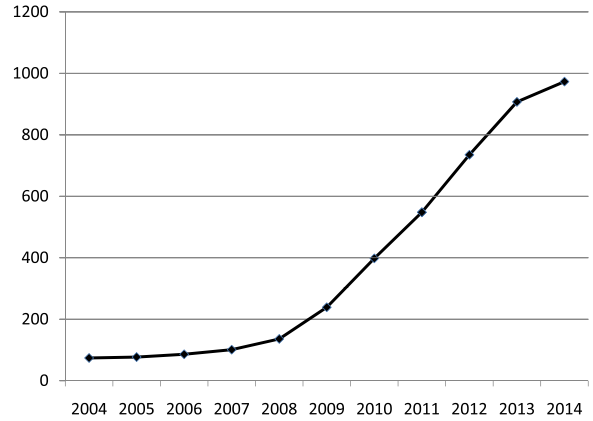

Fig. 1. Development of RECs in Germany. Müller and Holstenkamp (2015) and Kayser (2014).

supra-regional RECs relied on the F.I.T. policy for their revenue stream. Around 80% of the RECs in the survey relied on PV systems. Wind and other technologies were far less widely used.

REC sector growth, however, has been hampered by two recent policy changes. First, in July 2013, Germany adopted the Capital Investment Act (CIA; German: Kapitalanlagegesetzbuch, KAGB) to implement the European Union Directive 2011/61/EU on Alternative Investment Fund Managers. This changed German investment law, and until March 2015, uncertainty about how these changes would affect RECs had both limited the development of non-PV business models and curtailed the number of new RECs (Müller and Holstenkamp, 2015).

Finally, in March 2015, the German Federal Financial Supervisory Authority (BaFin) ruled that in most cases cooperatives do not fall under the CIA (BaFin – Federal Financial Supervisory Authority, 2015). Before this ruling, the BaFin had reasoned that an investment into other companies or cooperatives that amounted to more than 10% of the assets of a REC came under CIA regulations (BBEn, 2014). Had that reasoning stood, RECs investing in larger projects would have had to go through a cumbersome registration process with the BaFin. Even more onerous, they would have had to show that management had the qualifications necessary for running an investment business. Most cooperatives would have failed this test since RECs generally operate with a non-salaried management team that lacks a background in fund management.

Before the March 2015 ruling, RECs had restricted their non-PV strategies to limited investments in large-scale third party projects, the second most important revenue model of RECs (Klagge et al., 2016). These investments neither overtaxed the REC resources nor exceeded the members' risk tolerance. The lingering uncertainty around the CIA, however, affected plans for RECs to invest in larger projects not developed and operated by themselves. As a consequence, many RECs developed an investment backlog that they are still trying to clear.

A second policy change impacting REC sector growth has been reforms to the REA (Klagge et al., 2016; Yildiz, 2014). With these reforms, the German government implemented sharp reductions in the F.I.T., making PV installations far less profitable. These reductions prelude Germany's transition from a fixed-tariff support system to a tendering system in which prospective producers of renewable energy have to develop projects and bid on a government tender. The government then chooses the projects with the lowest production cost.

These changes have driven profit levels down while driving revenue risk up. Significant risk is now placed on bidders who have to invest in developing projects without knowing if their bids will be accepted. The latest reform of the REA (2016) provides special regulations aimed at lowering the risk for "citizens' energy projects", among them REC projects (Federal Ministry for Economic Affairs and Energy, 2016). RECs, other than their competitors do not have to obtain aa permit according to the Federal Immission Control Act before submitting a bid, but still need to invest into wind assessment and other expert services to develop projects, meaning they run the risk of losing investment capital.

These two changes – disruptive changes to the REA and uncertainties around the CIA - drove the number of new establishments in the REC sector down in 2014 and 2015. In 2015, only 40 RECs were founded, while the number in 2011 was 167 (DGRV, 2016). While the CIA uncertainties have in principle been resolved, the long-term REA impacts are only beginning to be felt. The net result is that RECs must now consider alternative methods of operation. In other words, RECs now face a new challenge: business model innovation.

Applying the business model concept to RECs may seem unorthodox, as the concept has been developed to analyze for-profit companies organized as corporations. But its fundamental definition – "The logic of the firm, the way it operates and how it creates value for its stakeholders" (Baden-Fuller and Morgan, 2010) – also applies to cooperatives. However, cooperatives define "value" differently than do corporations. In cooperatives, value for the members arising from the business model includes, of course, the return-on-investment value represented by dividend payments. But additional values accrue to members: the opportunity to source energy at attractive prices; the "ideological surplus value" (Klagge et al., 2016: 244), or psychological utility gained by buyers of green electricity (Hartmann and Apaolaza-Ibáñez, 2012); and the public benefit provided by the REC (Wüstenhagen and Boehnke, 2008). These additional values also often differentiate the RECs' business models from those pursued by for-profit organizations. The business model concept has in the past also informed research on non-profit organizations (Byerly, 2014; Cooney, 2011; Maguire, 2009).

Moreover, business models for renewable energy have received increased attention from researchers and practitioners in recent years (Richter, 2012, 2013a, 2013b; Aslani and Mohaghar, 2013; Behrangrad, 2015; San Román et al., 2011; Strupeit and Palm, 2016; Klagge et al., 2016; Hall and Roelich, 2016; Engelken et al., 2016). But 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 (2014) focuses on the way citizens invest money into renewable projects, i.e. on the investment vehicle and Klagge et al. (2016) refer to business models but mainly focus on key resources (location of the RE facilities and investors) as well as revenue streams. Business model elements have been used for categorizing RECs (Holstenkamp, 2012). Holstenkamp (2012) presents various approaches from the literature for categorizing RECs. They are mainly based on the RECs activities such as energy production or consulting (e.g. Theurl, 2008; Flieger, 2008). He also presents one approach by a regional cooperatives' association that is partly based on the question whether the REC partners with a local cooperative bank or municipality. The business model concept has also been applied to community energy (Walker, 2008; Juntunen and Hyysalo, 2015; Lund et al., 2010).

Still, RECs differ from joint stock companies or other types of business entities in one important characteristic: cooperatives operate under a democratic decision-making model where each member has one vote regardless of the size of his or her investment. This does not mean that the decision to adopt a new business model has to be made by the members at the annual general meeting (AGM). Provided the Articles of Association of the REC are written in broad enough terms, management can proceed with business model innovation without formal voting by the members. However, many managers abide by the egalitarian spirit of the REC and seek to legitimize decisions by taking them to the AGM. Besides, members can always replace a management team that adopts a business model unacceptable to the majority.

Hence any new business model needs to find acceptance by both members and management. The fact that each member has one vote regardless of the size of their investment means that management has

to convince not just a small group of major shareholders. This need for broad acceptance of new models in RECs leads to our two research questions:

1) Which business models do members and management contemplate for their REC?
2) How do members and management assess the potential of these business models for their REC, specifically: what barriers do members and management perceive?

There are a handful of studies that examine barriers for business model innovation in the field of renewables (Richter, 2013a, 2013b; Yildiz, 2014; Aslani and Mohaghar, 2013; Wüstenhagen and Boehnke, 2008). Also, Engelken et al. (2016) provide an overview. These studies, however, give little attention to how the actors perceive the new business models; even when they do, the context has mostly been large utilities with their non-renewable infrastructure. The barriers perceived by members and management of renewable energy cooperatives have not yet been the focus of research.

It is hoped that this study, while exploratory, will provide insight into the more far-reaching policy implications of Germany's transition from a fixed-tariff system to a tendering system. The fixed-tariff system has stimulated the growth of RECs, and these RECs, by promoting citizen involvement and helping to democratize the energy system, have played a key role in overcoming public barriers to renewable energy. If the German government wants RECs to play an important role in the energy transition process in the future, it is important to recognize innovation barriers that could limit the utility of such cooperatives.

2. Method

To gain insight into the perceptions of members and management of German RECs, we employed a qualitative research method, interviewing a set of actors in the industry and conducting non-participant observations of AGMs. Our approach was informed by the current literature on business models and on business model innovation.

2.1. The business model as a research tool

The business model concept is frequently used 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). Despite its widespread use, no generally accepted definition of a business model exists (Zott et al., 2011; Bock et al., 2012). Often cited definitions include those of Osterwalder and Pigneur (2010) or of Osterwalder (2004) who defines a business model as "… an abstract conceptual model that represents the business and money earning logic of a company." When analyzing renewable energy enterprises, researchers such as Strupeit and Palm (2016), or Gabriel and Kirkwood (2016), have used a structure based on the business model canvas of Osterwalder et al. (2005), depicted in Fig. 2.

As shown here, business model concepts delineate categories such as revenue model, value proposition, and customer interface (Bieger, 2011; Hamel, 2002; Zott and Amit, 2013; Hedman and Kalling, 2003). These broad categories allow for comparisons and overviews of different business model alternatives.

Business models for renewable energy can be structured in a similar manner, using sub-categories specific to the renewables field. These include sub-categories of key resources (e.g. wind power, PV) and key activities (e.g. generation, transmission & distribution, retail, consumption-related services), both used by Richter (2013b), Aslani and Mohaghar (2013) and Yildiz (2014). Ownership of generation equipment has also been used (Frantzis et al., 2008). However, this category is not covered by the elements of the business model concept (Fig. 1). Table 1 summarizes the most frequently mentioned business models in the field of renewable energy.

Considering the activities observed over the last two years in Germany's renewable energy industry, we identified the business model elements depicted in Table 2 as most relevant for RECs in Germany (Energieagentur Rheinland-Pfalz GmbH, 2016; Klagge et al., 2016). Table 2 follows the same structure as Table 1. However, the business models presented here could already be observed with RECs, which is not necessarily the case for the larger set of models presented in Table 1.

The morphology of REC business models in Table 3 goes one step further. As already explained in the Section 1 past research mostly does not cover all elements of the business model canvas, but just few, especially key activities and key resources. In order to provide a tool for a more complete description of REC business models, we have developed the morphology in Table 3 which contains all elements of the business model concept as presented in Fig. 1 and the potential parameter values.

2.2. Barriers to business model innovation

Barriers to business model innovation identified in the literature include internal factors such as a lack of awareness, perceptions of disruptive technologies, organizational inertia, culture, conflicts with existing business models and assets, as well as cognitive problems in understanding these (Chesbrough, 2010; Sosna et al., 2010; Friedrich von den Eichen et al., 2015; Bohnsack et al., 2014; Madjdi and Husig, 2011). Authors particularly emphasize cognitive barriers: "… new business model adoption is confronted with multiple barriers, none more significant than managers' cognitive barriers to change" (Dewald and Bowen, 2010: 197).

A number of barriers, both internal and external, have been identified as specific hindrances to adopting renewable energy business models (Table 4). We have structured them along the elements of the business model canvas as depicted in Fig. 2.

The following external barriers that cannot be allocated to any of the elements of the business model canvas, are also mentioned in the literature:

- Problems with public acceptance of renewables, e.g. the Not-In-My-Backyard effect (Richter, 2013a)
- Social barriers (Aslani and Mohaghar, 2013)

The barriers and barrier categories in Table 4 provided a structure for analyzing the results from our interviews and observation protocols.

2.3. Interviews and observation protocols

As we were investigating a new field – barriers to innovation in REC business models – we adopted an exploratory approach. After initial desk research and the analysis of roughly 100 REC websites, we used non-participant observation (Quinn Patton, 2015) in the annual general meetings of 15 RECs and subsequently conducted 38 qualitative interviews (Witzel and Reiter, 2012) of diverse stakeholders in the RECs. We regarded these semi-structured interviews as an appropriate method, since we sought to investigate the views and subjective assessments of our interview partners.

These interview partners included rank and file members, management team members and members of the supervisory boards of the RECs. The RECs were selected to yield a diverse sample set, so we chose RECs from bigger cities and from rural areas, small and large RECs, and RECs with different business models. An overview of the RECs under review can be found in Table 5. Both interviews and observations were embedded into a larger research project investigating conflicts in RECs; the conflicts and decisions concerning new business models were part of that research.

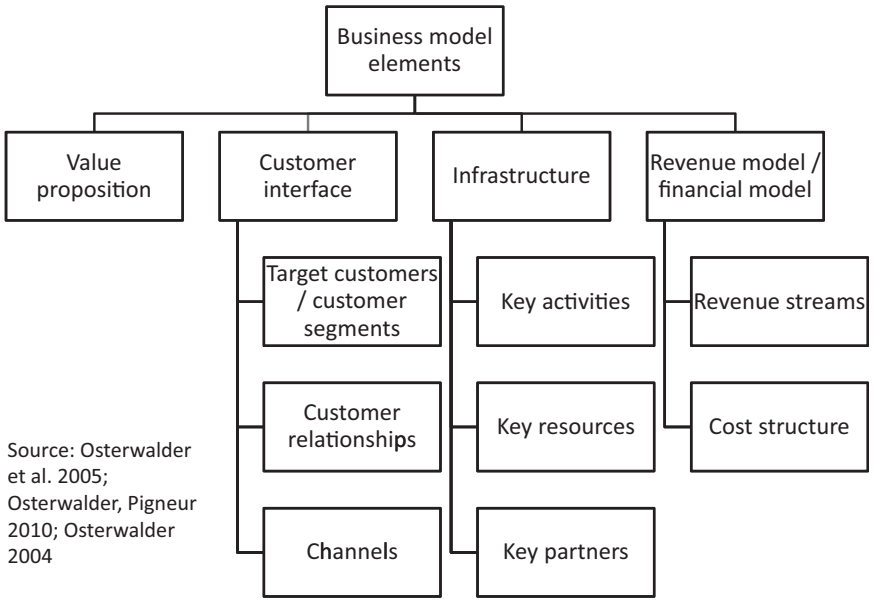

Fig. 2. Business model elements. Osterwalder et al. (2005), Osterwalder and Pigneur (2010) and Osterwalder (2004).

After the interviews, we created short postscripts and memos of every interview to inform initial discussions among members of the research team. All interviews were transcribed (in total, more than 2.700 pages) and underwent a qualitative content analysis using MAXQDA text analysis software (Krippendorff, 2013; Kuckartz, 2014).

In this analysis phase, we used an iterative approach to develop a set of categories, using broad concepts such as "business model", "evaluation (positive/negative)", "advantages of business model" or "disadvantages of business model" as first level categories. Further refinement of the categories proceeded inductively out of the interview transcripts and observation protocols. Together with the barrier categories described in Section 2.2, the results from our interviews allowed us to create categories situated between the high-level categories of 2.2 and the low-level categories evidenced by our informants' statements (Strauss and Corbin, 1998). While these mid-level categories were consistent with the literature, a previously unreported category of innovation barrier also emerged from informant responses. We termed this category "ethical concerns."

All interviews as well as the AGMs were conducted in German, so the statements reported in the Section 3 are our translations. The abbreviations used, e.g. BN05 A2w, identify the interview partner.

3. Results

Using the heuristic framework discussed in Section 2.1, we summarize below the results from our interview and observation protocol, presenting representative responses to illustrate attitudes among REC stakeholders.

3.1. Perception of business models

Interviewees confirmed that the traditional REC business model based on PV and F.I.T. provided a straightforward and low-risk approach to running their cooperatives. One interviewee summarized the hitherto dominant model of PV and F.I.T. as follows:

> "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 reflected on how cooperatives thrived in the past:

> "That was the heyday of PV systems, with a high F.I.T., and a relatively easy business model." (BN05 A1m).

About a third of the interviewees expressed the need for their REC to develop new business models. Some pointed out that the REC had collected funds from members and now needed to invest in new projects, since investments had been stalled due to uncertainty about the CIA. One REC manager put it bluntly – "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 could be developed and no growth achieved, the REC sooner or later would have to close down or merge with another REC.

A significant number of managers face the dilemma of either finding new ways to grow their business or standing still and having the business stagnate. They sometimes put this difficult choice of growth vs. stagnation directly before their members:

> "At the last annual general meeting I asked the 'question of faith'. Do we just keep what we have? Or should we move decisively and go for wind?" (N01 V2m).

Another manager seemed to recognize that standing still meant the end of the REC:

> " [...] after one year we draw a line and say, nothing has happened. Then maybe we merge with another REC. [...] There is no point to just maintaining the installations without adding other business models." (BN05 V1m).

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 the answers to our inquiries made clear that many still had only a vague idea of these models and lacked the knowledge of prerequisites and consequences needed for effective operational planning. They could not present fully structured business models covering all the elements shown in Tables 1 and 3 of Section 2.1. Mostly, they mentioned only one or two elements. So we structure their responses according to the dominant elements in their statements and use the elements of the business model canvas outlined in Fig. 2.

3.1.1. Key activities

In the field of *energy production*, the interviewees 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 (combined heat and power) in particular. They also talked about

Table 1
Frequently identified business models for renewable energy.

Key activities (steps in the value chain)	Generation and generation-related services	System operation, transmission & distribution	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 certified 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 and Palm, 2016)			Demand side management (Richter, 2013b; Behrangrad, 2015; Hall and Roelich, 2016)
	Technical services for distributed PV systems and product service systems (Frantzis et al., 2008; Strupeit, Palm, 2016)			Distributed storage, 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)

Table 2
Most relevant business model elements for RECs in Germany.

Key activities (step in the value chain)	Generation and generation-related services	System operation, transmission & distribution	Retail	Consumption-related services
Business model elements			Local direct sales of electricity (to customers in the direct vicinity of the plant, using certain provisions in the German REA that allow exemptions from e.g. grid related levies in this case)	Energy efficiency services
			Selling electricity to consumers in general (RECs as a utility)	
	Producing and selling heat to local households		Producing and selling heat to local households	E-Mobility (not purely energy-related)
				Real estate and energy management
	Contracting		Contracting	Contracting

Table 3
Morphology of REC business models.
Source: Structure based on Osterwalder et al. (2005).

Parameter (elements of the business model concept)	Potential parameter values				
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	Other service providers
Revenue stream	Remuneration per kWh	Participation in energy savings	Consulting fees		Dividend payouts

Table 4
Internal and external barriers.
Source: Structure based on Osterwalder et al. (2005).

Element of the business model canvas	Internal barriers	External barriers
Value proposition		Lack of demand, lack of public awareness of RE (i.e. customers, in management's perception, not asking for new services) (Richter, 2013b; Aslani and Mohaghar, 2013; Helms, 2016)
Key resources	Cognitive barriers (interview partners still thinking of electricity as a commodity and in terms of economies of scale and failing to develop new value propositions) (Richter, 2013b; Bohnsack et al., 2014)	Underdeveloped technology (Aslani and Mohaghar, 2013)
	Internal competition (renewable installations or services compete with fossil-fueled legacy equipment in incumbent utilities) (Yildiz, 2014; Helms, 2016)	
	Fluctuating generation patterns not in line with offering base load (Yildiz, 2014)	
	Lack of resources / competencies in the organization (e.g. knowledge of markets, capability to handle small distributed projects) (Richter, 2013b; Aslani and Mohaghar, 2013; Yildiz, 2014; Engelken et al., 2016; Hall and Roelich, 2016; Bohnsack et al., 2014)	
Revenue stream		Positive externalities (e.g. environmental benefits) that cannot be captured as monetary value (Wüstenhagen and Boehnke, 2008).
		Strong incumbents working against renewables via their political influence (Schleicher-Tappeser, 2012)
		Lack of clear supportive public policies (Aslani and Mohaghar, 2013; Hall and Roelich, 2016) and long-term reliability of policy instruments (mentioned by many authors, for an overview see Engelken et al. (2016))
Cost structure	Lack of profitability, high costs (Richter, 2013b; Aslani and Mohaghar, 2013; Richter, 2013a; Yildiz, 2014; Helms, 2016)	

less developed technologies like micro wind turbines or even exotic options like producing electricity with large kites. Energy storage was also mentioned sparsely as was grid operation (distribution).

Apart from operating generation facilities themselves, our interviewees came up with a number of alternative activities related to energy production. *Investments into large third-party projects* were most

Table 5
Overview of RECs under review.

REC No.	Established	Geographical context	Members (2014)	Revenue model	Technologies
N01	2009	Provincial town	391	F.I.T.	PV
N02	2013	Major city	53	F.I.T.	PV, wind
N03	2011	Rural	166	F.I.T., sales to members	Biomass (heat and power)
N04	2010	Rural	170	F.I.T.	PV
N05	2010	Rural	82	F.I.T.	PV
N06	2012	Major city	276	F.I.T., direct sales	PV
N07	2009	Rural	247	F.I.T.	PV
N08	2012	Provincial town	122	F.I.T.	PV
N09	2008	Rural	597	Sales to members, other direct sales	Biomass (heat and power), e-mobility
BN01	2012	Provincial town	176	F.I.T.	PV
BN02	2009	Rural	485	F.I.T.	PV
BN03	2011	Major city	146	F.I.T.	PV
BN04	2010	Major city	148	F.I.T.	PV
BN05	2012	Major city	78	F.I.T.	PV
BN06	2010	Provincial town	109	F.I.T.	PV

*Major City: > 100.000 inhabitants, Provincial Town: 5.000–100.000 inhabitants, Rural: < 5.000 inhabitants.

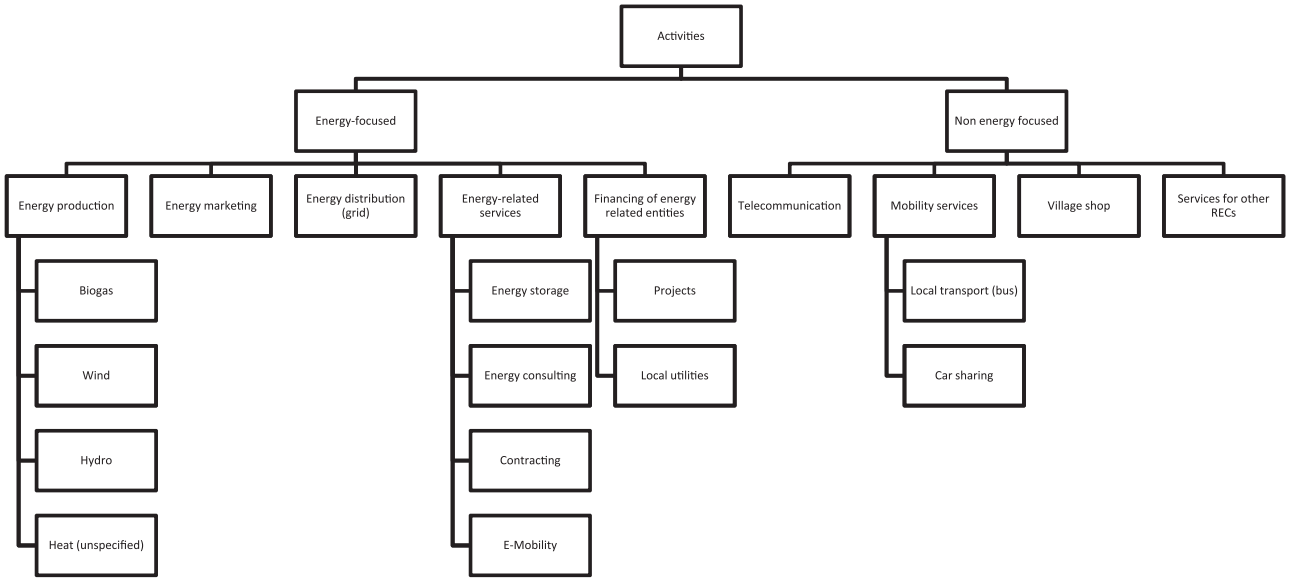

Fig. 3. Potential future activities mentioned in the interviews.

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 F.I.T. or revenues from selling electricity. This approach was generally regarded as less risky than operating a large project in-house. Five interviewees referred to projects of municipal utilities into which their REC could invest.

Another type of key activity mentioned was investing in an RE facility and then *leasing 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 qualify as self-consumption, thus making the leasing of a renewables facility a financially attractive option.

Activities in the field of *energy retail* were also a frequent subject raised by interviewees, 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; these are described further in Section 3.1.2 below.

A frequent subject in the interviews was *services* that RECs could provide in the area of energy efficiency. The activities ranged from advising companies and municipalities on how to save energy to services related to energy audits. Offering consulting services to private households on building insulation might also be part of the portfolio. While a frequent topic in interviews, these services were rarely discussed in AGMs, which might reflect the fact that, for most RECs, leveraging their experience to build out a consulting business would represent a significant shift away from their core business. Moreover, the transaction cost of energy efficiency-related consulting services can be high if the fees are calculated based on savings.

A service less based on consultancy competencies but still closely related to energy efficiency is *contracting,* which was also discussed in several interviews. Examples might be operating a CHP unit on the site of the customer. Another topic frequently mentioned 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 either not linked 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-

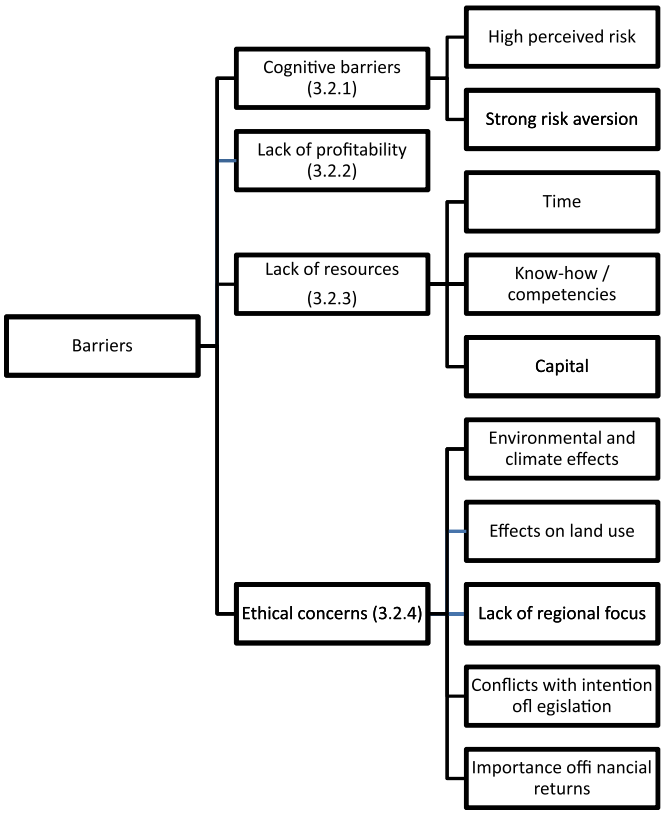

Fig. 4. Types of barriers to new business models in the analyzed renewable energy cooperatives.

operated village shop and yet another thought about operating a telecommunication network. A further activity that came up in the interviews was providing project development services for other RECs. Fig. 3 shows the activities mentioned in the interviews.

3.1.2. Customer segments

With regard to potential customers in energy retailing, some interviewees mentioned offering a green electricity product to a large number of consumers. Others thought of the REC's members as customers and still others thought about selling electricity to firms on whose roofs the REC would install a PV facility. In the field of energy efficiency services, our interviewees regarded companies, municipalities, and private households as prospective customers. Our interviewees did not mention explicitly that these prospects would have to become REC members, so the identity principle seemed not to be present or important to them. Identity principle means that members of a cooperative do benefit from the cooperative's activities by more than just receiving dividends, e.g. by buying goods and services from it. RECs in Germany have, however, frequently been criticized for the fact that they lack this substantial characteristic of cooperatives: their members are in many cases not customers (identity principle) and only benefit from the REC's activities in the form of dividends because the electricity is fed into the grid (FIT model) in most cases (Klagge et al., 2016).

3.1.3. Revenue models

The revenue models discussed 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, consulting fees would provide an income stream while for contracting, revenue would be generated as part of the energy savings or as rental fees for the equipment. In the case of lease models, revenue would come from a leasing fee while for investments in larger projects, it would derive from dividends.

3.1.4. Key resources

The key resources are closely connected to the contemplated activities. Thus, different systems such as wind power plants and biogas plants were mentioned. But interviewees also stressed the required know-how and the time needed to develop the new models, as discussed in Section 3.2 below. Building on these insights, a part of our interviewees emphasized that developing new business models into profitable enterprises would require a salaried management and paid employees. This represents an important finding, since it means our interview partners are questioning the long-term viability of the volunteer model, a hitherto fundamental feature of German RECs.

3.1.5. Key partnerships

Our interviewees were well aware that teaming with external partners is an important strategy to overcome barriers in implementing new business models. The topic of partnering strategies was especially prominent when considering activities involving the retailing of electricity. Other RECs, municipal utilities but also incumbent utilities and project developers were identified as potential partners. In particular, REC members explicitly mentioned the Bürgerwerke eG of Heidelberg as a potential key partner. Bürgerwerke eG acts as an aggregator supporting RECs in marketing their electricity to consumers, thus providing RECs with market access without requiring they invest in a marketing and sales administration structure.

3.2. Barriers to innovation

Given the many prospects for future business and potential business models contemplated by interviewees, it comes as no surprise that this topic generated heated debate in some of the AGMs. The first question, and most fundamental, is whether to maintain the status quo or to grow into new business areas. This is not an entirely new subject of disagreement, but the question has become more pressing as a result of energy policy changes over the last two years. Sometimes, REC management teams refuse new business models altogether: In the AGM of REC N08, the management stated that it is not the REC's role to offer consulting services or take out loans but to focus on production. Other models were dismissed as “theoretical”.

If the decision is made to move into new business areas, then thornier questions emerge, having the potential to spark strong conflicts in the future. These include the merits of investing in wind power (expert interview 2, N01 AR1w, N06 V2m, N07 V1m); the readiness to take on riskier hydropower and wind power projects; the operational challenges presented by rental or leasing models; and the climate effects of retailing green energy. Ongoing debate centers around the question of business priorities: should the REC prioritize the pursuit of environmental or financial goals?

Fig. 4 presents the barriers mentioned by our interviewees, structured along the dimensions presented in Section 2.2 (Table 4).

3.2.1. Cognitive barriers

We encountered cognitive barriers primarily as the *high-perceived risk* of new business ventures and *strong risk aversion* of the interviewees. The interviewees had a keen sense of the risks involved in several of the new business models. Comparing operating a wind turbine on one's own to buying a small stake in a wind park, one REC manager remarked:

> “[...] rather than buying a wind turbine completely. Firstly, that [buying a wind turbine] is much more expensive and the risk is bigger.” (N01 V1m)

Moreover, members of management perceived it to be their responsibility to shield members from risky activities:

> “If a private person does that – no problem. I am, as a REC manager, [...] answerable to the members and must not invest their

money in a risky way." (N07 V1m)

"The [members] expect that we will manage the business affairs properly and soundly and not start projects that contain risks." (N06 V4m)

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

"We are cautious and considerate" (REC supervisory board member in AGM BN02)

Generally, interviewees expressed strong risk aversion, which also was an impediment to taking out a loan or investing in larger projects. In two AGMs (N08, BN03), the management stated explicitly their desire to operate on a 100%-equity basis.

"We'd rather do a smaller number of projects. But on those that we implement, 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 management team also stated in the AGM that due to the risks of new projects they wanted to involve the AGM in the decision making process although the management could have decided about this on their own (AGM BN02).

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 [this is] already implied by the legal form." (BN03 M1m)

3.2.2. Lack of profitability

Profitability issues were mentioned, but not very often. For some proposed projects, members believed that the cashflow would come too late. One REC wanted to install PV equipment on a hospital roof and sell the electricity to the hospital, but the supervisory board member doubted that the REC would be able to offer the hospital a competitive price. RECs contemplating heating services for their local districts felt they would not be able to overcome the competitive disadvantage created by the currently low price of oil.

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 varied but included first of all, time. Most RECs in our sample are still managed by volunteers who can only devote a limited amount of time to their REC activities. Interviewees either saw their new business options as limited by time constraints or pointed out that additional people would have to be employed to take on new business projects. In the AGM of REC BN04, one member even asked the management during the meeting if the projects can be realized from the viewpoint of human resources.

The lack of know-how or competencies represents the second most often mentioned constraint to business model innovation. Interviewees acknowledged that many of the new models require more know-how than the PV model and that the required competencies exceeded those of management, especially management that operates on a non-salaried basis:

"Well, many [RECs] have now started selling green electricity. But other things are too complex to do with a non-salaried management. Non-salaried management works only for projects which you can carry out with relatively little prior knowledge." (BN05 V2m)

Related to this lack of know-how or management competency was the general recognition that developing new business models means current membership would have to confront daunting complexities:

"[...] have googled about this [direct marketing] and recognized 'oh my god, that is all terribly complicated, let's drop the whole thing.'" (N06 TN14m)

A third constraint to new business is capital. New business models like investing in a wind park usually require far greater investments than rooftop PV projects, and our interviewees felt these would overstretch the financial resources of their organizations. In one case, when considering consultant services, the upfront costs for establishing the business were perceived as too high. In AGM BN01, a management team member pointed out that taking on wind projects would mean a comprehensive change by saying that the REC would have to become a "real business enterprise".

3.2.4. Ethical concerns

An internal barrier not mentioned in the literature but playing an important role in energy cooperatives can be termed normative or ethical concerns. The lower part of Fig. 4 illustrates our grouping of these concerns into five distinct categories.

First, interviewees expressed concerns about the effect of new business models on the environment or on climate change. These concerns were raised for several technologies. Regarding 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: the energy transition or protecting nature?" (BN05 A2w)

On biogas, there was sometimes outright rejection on an ethical basis:

"We don't want that because it is not quite as bio as its label suggests." (N06 AR4w).

"We can invest into rapeseed monocultures. But maybe we do not want this." (supervisory board member in AGM BN06)

From a related point of view arose the idea of changing the way biomass plants operate, to make them more environmentally friendly (N09 AR3m). Regarding wind, concerns were raised about birds and bats being killed and about the visual impact on the landscape (BN 05 A2w; N07 V1m; N04 V1m; BN03 V2m) In the AGM of N01there was a heated debate on the visual impact of wind power projects and one member exclaimed that he went on holiday to the North Sea and found the windmills "beautiful". In one of the interviews, a REC manager reported a member calling by phone and saying with regard to wind farms:

"Recently, I was on the North Sea coast, that looks awful" (N07 V1m)

Retailing of green electricity products also met with similar reservations. Members questioned the climate protection effects of products based mostly on certificates from Scandinavian hydropower and pointed out that such efforts do not entail the installation of new RE facilities even if the REC can generate income from a new green retail product. One REC manager was reproached by a member when planning to start green electricity retailing:

"You are working [in case the plan is realized] with certificates. That is no real eco electricity". (N04 V 1m)

A second class of ethical concerns relates to how a new business would affect land use, echoing the land-for-fuel vs. land-for-food debate. These concerns dominated considerations of biogas plants that use energy crops that could instead be used as food (NT_Int_GT_AR1; N06 TN 14m).

A third class of concerns stems from members' wariness about losing their regional focus by venturing into new business areas. While wind parks on the German coast or the marketing of green electricity outside the region were seen as interesting business opportunities, 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, this was more a normative issue, as questions were raised about whether the REC's Articles of Association would allow participation in such projects.

A fourth class of ethical concerns focuses on the dubious alignment of new business models with the country's energy policy. Lease models in which the REC owns an RE facility and rents it to a third party so that the third party can claim self-consumption under German law met with especially harsh criticism. Interviewees pointed out that while such solutions may be legal, they were in effect loopholes that contravened the intent of the law:

" [...] and I say: , I don't do such models. That is bypassing the will of the lawmaker. The lawmaker did not want it that way." (N01 V2m)

"We don't produce anything, we don't sell anything, we have invested money and rent something to somebody. That smells a bit fishy to me." (N09 V1m)

Finally, a fifth barrier to business model innovation arises from doubts about the need to pursue high investment returns. 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. One interviewee left no doubt about his position:

" [...] it was wrong in my view that you could make a return of more than 10% or 12%, at the expense of the consumers. I consider that to be immoral." (N06 V4m)

The goal of making profits should not override the ethical intentions of the cooperative:

" [...] we ask ourselves: how can we manage well, have good returns and do that within an ethically acceptable framework." (BN03 V2m)

One supervisory board member expressed concerns about the social impact of pursuing higher investment returns. Reflecting on the working conditions of migrant workers installing PV systems in Germany, he said:

"We ask our suppliers: show me how you pay your people. [...] To say just for the sake of the return on my investment, he [the migrant worker] should get 3,50 Euro [per hour] and sleep in a tent, all so my return is three percent higher – No, then I don't want that extra three percent." (BN03 A1m)

3.2.5. External barriers

The Capital Investment Act (CIA) was mentioned several times as putting a legal end to models that focused on investments in larger projects, but this should by now be solved by the March 2015 ruling by the German Federal Financial Supervisory Authority (BaFin) on the scope of the CIA. Another external barrier was perceived political and public resistance to REC projects in the region and that certain activities such as combined heat and power would mean going into competition with municipal utilities. For some technologies, such as using kites for producing electricity and certain hydropower technologies, our interviewees had doubts concerning market readiness and efficiency.

4. Discussion

Regarding our first research question ("Which potential business models do members and management contemplate for their REC?"), our results demonstrate that nearly all those business models listed in Table 2, representing key activities in the nomenclature of Osterwalder and Pigneur (2010), have been contemplated by our interviewees. However, it is equally clear that REC management in many cases the competencies needed to transform these models into operational business ventures. Further policy actions are needed – whether in the form of communication and training by field associations, or services provided by government agencies or other organizations – if the Germany government wants RECs to have the wherewithal to put future business models into successful practice.

Selling renewable electricity to private end customers seems the most accessible avenue of new business for RECs. This is not only because consumers have demonstrated a willingness to pay a premium for renewable origins and prefer regional origins (Kaenzig et al., 2013; Mattes, 2012), but also because there exist customer segments willing to pay a further premium for electricity produced by a cooperative (Sagebiel et al., 2014). Moreover, RECs can draw on their members and their social networks to build up their customer base. Customers are willing to pay higher retail rates when they either directly as investors or indirectly as community members receive revenue from those higher rates.

Quite a few RECs have successfully launched this model, many of them through aggregators such as Bürgerwerke eG. Building out the aggregator market would thus help RECs flourish in the future. As for other players, such as municipal utilities, it is important for corporate planners to recognize that RECs can be valuable partners in creating a local green electricity brand.

Regarding our second research question into innovation barriers, one of our central findings reveals an important difference between the cognitive barriers identified in the literature for incumbent utilities and those that exist in RECs. The most formidable cognitive barrier to innovation in RECs consists of sensitivity to and aversion toward risk. This stems from the established REC business model that relies on generating electricity through PV systems and receiving a fixed F.I.T.. This model has had great success in spawning RECs because it is virtually risk-free. As such, current REC management has developed the view that shielding members from investment risk is one of their main duties. Some managers even perceive a fundamental contradiction between managing a cooperative and taking on risk. They interpret risk to mean not just investing in new activities, like operating a wind power plant, but also leveraging members' investments and taking on debt.

Given the fact that German energy policy is moving away from a F.I.T. system and toward a tendering system with inherent risk for producers – a system where the marketing of energy and the offsetting of losses incurred by losing bids plays an ever larger role – this represents a finding of critical importance for policy makers. A widely accepted policy goal in Germany, promoted in public and political discourse, is the "Akteursvielfalt" (diversity of actors) in the energy transition (Federal Ministry for Economic Affairs and Energy, 2016). RECs have served as valuable allies in pursuit of this goal, e.g. by supporting a high level of citizen involvement in the energy transition. Policy makers committed to supporting the ongoing success of the energy transition must recognize that current attitudes toward risk pose a serious threat to further growth of the REC sector in Germany. Taking steps to mitigate risk to RECs warrants serious consideration. Indeed, many RECs have already bought Directors and Officers (D & O) liability insurance to indemnify their management against possible legal actions brought by a risk-averse membership.

A further finding with policy implications is the "Chicken and Egg" strategy problem we uncovered: in order to implement new business models, RECs need salaried management, but to pay managers, they need the revenues from new businesses. Without new revenues, RECs

are constrained by current investment amounts, typically rather small – an average of EUR 2.2m for all RECs in Germany with roughly 40% at less than EUR 0.5 m (DGRV, 2016). Building up revenues, from our perspective, creates a clear need for professional management, a view shared by other researchers (e.g. Klagge et al., 2016). The need for professional, i.e. salaried, management also arises from the need to acquire competencies and from the need to invest time in developing new businesses, time that most REC management teams, operating on a voluntary basis, do not have.

A first option here would be to switch from a non-salaried to a salaried management and also take on employees in administrative functions so that the management could concentrate on strategy and leadership. This might be called 'internal resource expansion'; however, funds would clearly be needed for this, making it an unrealistic option for many RECs. Sharing the new personnel with other RECs could be a way to mitigate the cost problem. A second and more realistic option would be developing partnerships with other organizations, similar to what Richter (2013b) proposed for incumbent utilities to overcome constraints when implementing new business models for renewable energy.

In fact, according to a survey from 2014, nearly 40% of regional RECs and more than 60% of supra-regional RECs already work with collaborative agreements of some sort. When selling green energy, partnerships with an aggregator that takes over the administrative tasks and partly also the marketing of energy have proven successful. The Bürgerwerke eG in Heidelberg/Germany as a 'cooperative of cooperatives' is one example; this firm markets the electricity of almost 60 RECs to a broad customer base (Buergerwerke eG, 2016). But other potential partners include banks, housing cooperatives, established players in the energy industry and municipal utilities (Klagge et al., 2016). Local policy makers overseeing municipal utilities can foster partnerships with RECs for their external resource expansion, thus helping to realize stated energy policy goals. However, municipal utilities can also regard RECs as unwelcome competition and may not be ready for partnerships. In one of the RECs (N01) we had hints from the interviews that the representatives of the municipal utility in the REC opposed a new business model in the REC. Our interviewee said that she believed that the utility's representatives safeguarded the utility's interests in their position in the REC. In another REC (BN05) one member reported that the local utility lowered their prices to prevent an industrial customer from cooperating with the REC. The same utility also did not allow one of their employees to take a management position in the REC.

Moreover, research from the UK shows that cooperation of community energy actors and project developers is ridden with problems stemming from lack of mutual trust (Goedkoop and Devine-Wright, 2016).

A final finding with intriguing policy implications concerns a category of barriers not previously mentioned in the literature, yet clearly manifested in our study. This is what we have termed ethical concerns, but they might also be termed ethical commitments.

For example, the environmental effects of certain types of new activities, especially wind power and biogas are a major concern, although they could be interesting options from a financial perspective. This is not surprising, given the results of a survey by Holstenkamp and Kahla (2016) that found nature conservation to be the second most important investment motive of REC members, only slightly behind wanting to support the energy transition. Yet the energy transition in its broad context is a form of nature conservation, and when this broader connection can be recognized, widespread reservations against biogas in Germany (Herbes et al., 2014) and, to a lesser extent, reservations against wind power (Pohl et al., 2012; Sunak and Madlener, 2016) might be eased.

In a similar vein, the third most important investment motive in the survey by Holstenkamp and Kahla (2016) was the generation of added value for the region. This constrains RECs from investing in projects outside the region, but might serve to garner support for new projects inside the region, projects whose success depends on local support. Local governments seeking to encourage wind farm proposals or other renewable options should be able to find advocates in their local RECs.

On ethical grounds, our interviewees also rejected rental or lease models combined with self-consumption by the lessee. In their view, such models are 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 standards that REC members set themselves and their REC, which should be heartening to the country's lawmakers. Moreover, some members also seem to shy away from returns on investment that they view as excessive. This is in line with research on REC members' investment motives where the financial return has been identified as significantly less important than it is in other legal forms of investment in the renewable sector (Degenhart and Nestle, 2014). Again, both findings point to a reserve of social responsibility in cooperatives that, in principle, could support renewable energy policy while contributing to REC growth.

Indeed, ethical concerns are a double-edged sword: they can impede REC development but also contribute to REC growth. Of course, if members cannot agree on certain technologies like wind power, this will exclude the REC from many growth options. But a scrupulous approach that tries to minimize the potential negative environmental impact of a business model can also strengthen the RECs pro-environmental reputation. This in turn can translate into higher credibility and attractiveness of the green energy products offered by the REC. For REC management, the awareness of the potential ethical concerns found 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 formulation, partly with external facilitators taken from the wider audience of energy consultants, planners and researchers. One interviewee reported that after the mission statement workshop, some members who had been reducing their presence in the REC before, came back and became more active again. He also stated that after the workshop, no critical conflicts arose for the next two to three years.

The question why organizations adopt ethical practices has been widely discussed. In a general view, factors lying in the personal preferences of individuals, in the context or an interaction of both have been discussed for more than 20 years (Brady and Hatch, 1992; Wolfe, 1991; Minkes et al., 1999; Husted and Allen, 2008; Stormer, 2003). A review of this discourse is beyond the scope of this paper. But from a theoretical perspective, it would be interesting to identify the main drivers of the ethical commitments voiced by REC members and management. One approach would be to look at the members' motivations i.e. personal preferences, which were discussed above. In this perspective, the RECs' ethical commitments would primarily mirror the members' ethical beliefs. But there is also the possibility that the legal form or other features of the REC such as the name that the REC members once chose for themselves, become external to the REC and create for REC management the feeling of an expectation by the public to follow high ethical standards. This would be a process of externalization (Berger and Luckmann, 1966) as Maniora has described it for the effect of integrated reporting on the integration of ethics into the core business model of companies (Maniora, 2017).

5. Conclusions and policy implications

We discuss the policy implications of our findings from two points of view: that of REC management and that of those involved in making energy policy.

5.1. Implications for REC management

Given the constraints and barriers for implementing new business models and the relatively small size of many German RECs, there are a

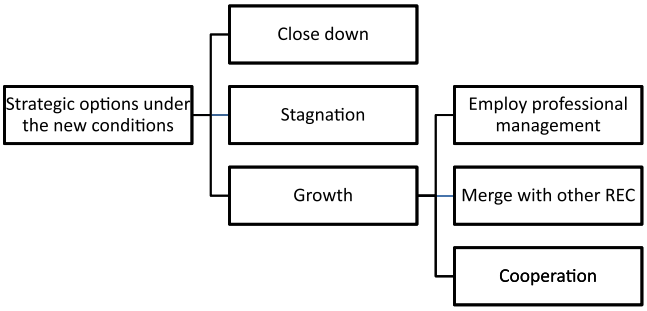

Fig. 5. Strategic options.

number of potential strategies that we see for them and that can already be observed in the market (Fig. 5). 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 dissolved and sold their assets. Others have chosen not to grow but to focus on managing the existing assets (stagnation) with the current structure, i.e. in most cases non-salaried management.

A third option, especially for RECs of subcritical size, is to merge with another, potentially larger REC. Two variants of this strategy can be witnessed in the current market: The first is a formal merger with all the legal requirements that entails; an example of this strategy can be seen in the case of Energiegenossenschaft Söhre eG and Bürger Energie Kassel eG which merged in 2014 (Landesnetzwerk Bürger EnergieGenossenschaften Hessen e.V, 2015). In the second variant, one REC sells its assets to the other, is subsequently dissolved and its members become new members of the other REC. An example of this is the Bürgerstrom – Bergische Energie eG i.G. which transferred its assets to Bergische Bürgerkraft Energiegenossenschaft eG in 2013 (Melneczuk, 2013). We will probably see dissolutions and rescue mergers of more RECS in the years to come.

Yet, from the interviews as well as from the literature (e.g. Klagge et al., 2016) we have also identified options that enable further growth: first, internal professionalization by employing a salaried management and staff; second, collaboration with external partners. While the former requires a level of capitalization that many RECs may not enjoy, the latter represents a proven strategy that nearly 40% of regional RECs and more than 60% of supra-regional RECs have already adopted. A prime example of this strategy is the selling of green energy through a partnership with an aggregator that takes over the administrative tasks and partly also the marketing of energy. The Bürgerwerke eG in Heidelberg/Germany is an example of one such aggregator, but other potential partners include banks, housing co-operatives, established players in the energy industry and municipal utilities.

In order to identify promising business models, each REC needs to become aware of its specific resources. We see the strong local roots and local knowledge as the REC's most marketable resources. Building on strong local support and consumer willingness-to-pay for green energy, combined with a partnership with an aggregator that takes care of administering customer accounts, appears to us to be a promising model for RECs. The REC's intimate knowledge of the region can be leveraged in project development when it is critical to garner support from the local population as well as from authorities and political decision makers on the local and regional level. The REC can also transform their positive regional image into a strong value proposition (environmental friendly, regional, participative electricity production) for acquiring retail electricity customers. In this way, RECs can be valuable partners for professional project developers from outside the region.

Looking at the above options from the analytical perspective of the business model canvas (Fig. 1), it becomes clear that the following elements are key for future growth strategies: The first is the 'value proposition', for which the RECs can build on a high acceptance and also a high WTP for green electricity, which is, for some customers even increased by the provider being a REC. The second element are the 'key partners', because due to the resource constraints outlined in Section 3.2.3, RECs in Germany need partners in order to handle bigger projects and serve retail customers in a professional manner.

In order to implement any new business model, a REC will have to tackle three major barriers: Lack of resources – time, competency and capital; strong risk aversion, especially among members of the REC management team; and ethical concerns that focus on the impact of any new model on the environment, on the regional economy, and on the overall intent of energy transition legislation.

5.2. Implications for policy makers

Changing energy policy from a F.I.T. to an auction system is likely to have significant effects on RECs. While transitioning to a tendering system does transfer pricing decisions from the government to the market, it also removes investor security from community projects and introduces pricing risk that community initiatives are less able to manage than are established corporate entities. The shift to a tendering system, i.e. an open market bidding system, poses the risk that corporate entities will gain control over the renewables transition by exercising the inherent advantage they hold over community initiatives. Corporate entities employ professionals adept at managing market risk, while community initiatives rely on local expertise and trust factors that derive from the local context. Moreover, corporate players often have a larger project portfolio allowing risk diversification. Shifting the energy transition to corporate entities risks squandering the vast social capital created by the citizen energy movement, a movement supported primarily by RECs.

Should policy makers want to foster community buy-in and recognize that corporate decision making responds to investor objectives and so does not always align with the long-term, more altruistic, interests of society, then policy steps need to be taken to empower community participation. Energy corporations whose business has prospered over decades from the exploitation of fossil fuels have amassed financial resources and developed risk management expertise that community initiatives lack. If policy makers see an important role for community initiatives to play in the transition to sustainable energy practices, then those policy makers need to develop strategies to support these community initiatives.

Central among those strategies are policies that restore investor security by mitigating the risk introduced by the transition from F.I.T. to an auction system. The German government has already made first steps toward this in the regulations pertaining to wind power auctions in the new REA, but RECs and their associations still regard these as insufficient.

Besides lowering risk, government can support REC evolution by providing platforms and support for further professionalization and partnering activities of RECs. Offering special training in cooperation with REC associations is one approach. With municipalities in many cases being the owners of the 1000+ municipal utilities in Germany, local policy makers have a strong lever to encourage those utilities to partner with RECs, thus helping them in their resource expansion and in tackling more complex projects in the future.

Other actions suggested by our research include:

- Similar to the Small Business Administration (SBA) used in the U.S. to support small businesses, an agency could be created to support the interests of RECs. It could offer advice, counseling, and direct aid. Loan guarantees could be made available to appease risk-averse REC management.
- Legislation could stipulate that RECs receive a fair proportion – either by set-asides or other mechanisms – of tendered government contracts.

- Corporate planners could consider partnerships with RECs to create a local green electricity brand.
- Partnerships between RECs and banks, housing cooperatives, established players in the energy industry, or municipal utilities could be encouraged.
- Energy consultants, planners and researchers could make their expertise available to local RECs to assist stakeholders in formulating strategy.

From a broad perspective, policy makers would be wise to recognize that the successful transition to renewable energy calls for a suitable mix of renewable sources, not just a focus on the cheapest ones. Furthermore, the broad-based citizen engagement that RECs have created is in fact a reserve of social capital supporting the energy transition. Policy makers committed to supporting this transition would do well to leverage the momentum created by RECs, to use it, and to build it further. Shifting to a tendering system may fulfill other policy objectives, but it can also threaten the progress made in decentralizing and democratizing the energy system.

However, while RECs certainly play a significant role in the German community energy sector, we have to point out that there are other important forms of community energy that must not be overlooked: First, the 700+ municipal utilities in Germany would in other countries probably be considered as 'community energy'. Second, German households account for a sizeable part of PV installations and third there are other legal forms such as GmbH (limited company) or GbR (partnership under the Civil Law) in which citizens establish joint projects.

6. Limitations and avenues for further research

Our approach was based on qualitative interviews and observations and aimed at identifying barriers to new business models in RECs. Therefore, our goal was not to provide quantitative data such as relative frequencies that might provide information on the importance of specific barriers. Secondly, our goal was not to provide in-depth case studies. Taking into account that perceptions of risk may have 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 better understand 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. One could, for example differentiate between purely regional and supra-regional RECs or between RECs of different size or between RECs using different business models to see if management's and members' attitudes towards new business models are different. RECs are by no means a homogenous phenomenon and their members' investment motives can vary between different types of RECs (Holstenkamp and Kahla, 2016). Another interesting topic for further research is the relation between discourses on specific renewable energy technologies as voiced by our interviewees and the discourse in the general population. The concerns of our respondents e.g. on biogas seem to mirror a general discourse in the German public. But are REC members simply taking these concerns from the public discourse to the REC or are RECs platforms where new positions are formed and then may spill over to the public discourse? This also relates to the question of the drivers of RECs' ethical commitments as discussed above. An inquiry into the drivers would probably entail qualitative interviews on how certain REC positions evolved over time.

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