



Renewable Energy Cooperatives as an instrument towards the energy transition in Spain



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ABSTRACT

Renewable Energy Sources (RES) offer a key transformative potential from a social point of view due to their modularity and capacity to generate energy at local level, allowing for the development of democratic and participative bottom-up initiatives. Spanish RES cooperatives, unlike other European countries, are few in number. Here, we review their development by applying the Multi-Level Perspective approach. Spanish RES cooperatives have recently come up against a hostile regulatory and economic context, which has induced specific organizational and operating structures such as the application of innovative participation methods and investment tools. Spanish RES cooperatives regularly collaborate in sharing learning processes and experiences, having also demonstrated their capacity to spread new ideas at both social and political levels. However, despite their growth and territorial spread over the last few years, RES cooperatives still have a minor presence in the Spanish energy system. Although some internal factors may limit their potential as an active instrument towards the transition to RES in the country, the regime's resistance is found to be the main barrier. This paper concludes with some recommendations for policy makers and RES cooperatives to enhance its potential role in the forthcoming energy transition process.

1. Introduction

The transition from fossil fuels to Renewable Energy Sources (RES) is an indispensable condition to achieve sustainable socio-economic systems. In particular, the interconnected challenges of climate change and fossil fuel depletion require active policies towards a fast RES transition (Capellán-Pérez et al., 2014; Wang et al., 2017). This transition is very challenging for advanced industrialized countries, where energy consumption has increased 10–15 times since the Industrial Revolution and is currently dominated by fossil fuel resources, as well as for the so-called “developing” countries due to their lack of financial resources and expertise while facing rapid increases in energy demand (Smil, 2008).

Despite their environmental impacts, fossil fuels are characterized by favorable physical-chemical properties (e.g. high power density, storable, inert at standard ambient conditions, etc.) that allow manageable, high-quality energy flows to easily supply human societies. In contrast, RES are generally characterized by lower power density levels, their use competes with other processes of the biosphere, while those

with a higher potential (i.e. wind, solar) are critically affected by their intermittence and variability (de Castro et al., 2013; Hall and Klitgaard, 2012; Smil, 2015, 2015, 2008; Trainer, 2017, 2012, 2010). However, RES offer a key transformative potential from a social point of view due to their modularity and capacity to generate energy at a local level, allowing for the development of local, democratic and participative bottom-up initiatives. So, the collective ownership of RES allows the democratization of access to capital (or the means of production), and thus it has the potential to contribute to the energy transition in a socially more profound way than a mere technological fix (Barca, 2011; Huybrechts, 2013; Johanisova and Wolf, 2012; Kunze and Becker, 2015; Schneider et al., 2010). For this reason, it has the support of social movements that oppose opencast mining, fracking and fuel poverty. Additionally, the participation of local communities in the decision-making and management concerning new RES projects substantially helps to mitigate the so-called Not In My Back Yard (NIMBY) effect (Avila, 2018; Huybrechts and Mertens, 2014). Amongst RES, solar photovoltaic (PV), onshore wind and biomass heating are particularly attractive technologies for citizens due to their maturity,

Abbreviations: RES, Renewable Energy Sources; PV, Photovoltaic; CSP, Concentrating Solar Thermal; USA, United States of America; MLP, Multi-Level Perspective; EU, European Union; REC, Renewable Energy Certificate; SR, Special Regime; GCC, Gas Combined Cycle; Px1NME, Platform for a New Energy Model

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modularity, simplicity, high reliability and the availability of technical service providers, while those technologies requiring larger investments are financially unappealing to citizens (e.g. large hydro-electric power production, offshore wind power and geothermal energy) (Romero-Rubio and de Andrés Díaz, 2015).

Cooperatives and municipal utilities are the two most common collective alternatives to traditional ownership structures (Becker and Kunze, 2014; Kunze and Becker, 2014; REN21, 2016). Since Spain lacks a tradition of municipal utilities, this paper is focused on RES cooperatives,¹ which refer to a business model where citizens jointly own and participate in RES and energy efficiency projects. Cooperatives observe the following principles: voluntary and open membership; democratic member control; economic participation and direct ownership; autonomy and independence; education, training and information; cooperation between cooperatives and community; and environmental concern (REScoop, 2016). Hence, this model presents clear advantages to tackle the global environmental crisis in relation to the technocratic approach based on centralized ownership and electricity generation, given that the sustainability crisis is both a technic and social challenge.

Around 3000 organizations have been reported as RES cooperatives across Europe, although with an uneven distribution (Huybrechts and Mertens, 2014; REScoop, 2016). A review from 2014 found that “Energy Democracy” projects have spread mostly in Western Europe (Denmark, the Netherlands, Belgium, Germany,² Austria, Northern Italy, Sweden, the UK and France), and to a lesser extent in Spain and southern Italy. These organizations are also being developed in countries where RES play only a relatively small role in the energy mix, such as France, the Netherlands or the UK. In spite of a high share of wind energy, no signs of local and democratic energy projects were found in Portugal and the Baltic countries. This is also the case for other countries where energy supply is dominated by fossil fuels, such as many of the countries in Eastern and Central Europe (Kunze and Becker, 2014). The model, with a great diversity of typologies, is present and growing in other regions of the world, such as Asia, Latin America and Africa (ILO, 2013; REN21, 2016).

Even though there is no straightforward explanation for addressing the differences in the level of development of RES cooperatives in different countries, key factors are the historical influence of the ecologist and anti-nuclear movements, the spread of municipal utilities, the impact of the oil shocks in the 1970s, together with the related policy-responses and the particular socio-political-cultural context (Bermejo, 2013; Huybrechts and Mertens, 2014). These organizations perform three main economic functions: the generation, distribution and retailing of renewable energy, usually under the form of electricity, although examples also exist for heating and transport.

Many cooperatives dealing with RES generation can be found across Europe. In general, European RES cooperatives started in the 1970s and 1980s with the promotion of community-owned wind energy projects but, as time went by, new technologies are being incorporated such as PV, as well as covering heating needs by the use of biomass boilers or solar thermal panels connected to district heating networks (Agterbosch et al., 2004; Boon and Dieperink, 2014; DEA, 2017; Enzensberger et al.,

¹ Many terms are used in the literature for a similar concept despite different legal forms of organization: “collective and politically motivated renewable energy projects (CPEs)” (Becker and Kunze, 2014), “Sustainable energy communities (SECs)” (Romero-Rubio and de Andrés Díaz, 2015), “Renewable energy communities (RECs)” (Docí et al., 2015), “REScoops” (the European Federation of Energy Cooperatives, REScoop.eu), “Local Renewable Energy Organizations” (LREO) (Boon and Dieperink, 2014), etc. For the sake of simplicity and to avoid creating a new term, in this article, we use “Renewable Energy Sources cooperatives”, i.e. “RES cooperatives” (or “RE cooperatives” in the line of (Huybrechts and Mertens, 2014)).

² (Debor, 2014) report 942 RES production cooperatives in Germany by 31st December 2013.

2003; Gotchev, 2015; Kunze and Becker, 2014; Madlener, 2007; Schreuer and Weismeyer-Sammer, 2010; Vansintjan, 2015).

The specific ownership structure of the electric system in each country determines the opportunity of RES cooperatives to distribute renewable electricity. Thus, RES cooperatives are more likely to distribute electricity in those countries where the electric network is publicly owned and privately operated after a public tender. This is the case of Germany, where citizen owned cooperatives have recently acquired the management of 90 local distribution networks around the country, alongside a wave of re-municipalization of energy networks and supply (Julian, 2014; Wagner et al., 2015). In the case of the USA, over 800 rural electric cooperatives distribute electricity to around 42 million people. Despite they use a limited share of RES generation, their contribution is rapidly increasing (Bermejo, 2013; NRECA, 2016).

RES cooperatives can also retail energy, which consists of buying energy on the market and selling it to domestic consumers (often members). However, in some cases, such as the electricity sector, the fact that most markets have only recently opened up to competition and are still *de facto* controlled by a small number of traditional electrical companies makes the operation of RES cooperatives more difficult (Huybrechts, 2013).

Amongst the most significant RES cooperatives at the European level, the following can be found: *Enercoop* (France), comprising 10s-order regional cooperatives (42,000 members) and 131 producers (81 MW), which delivers 245 GWh of renewable electricity to its 52,000 customers (40% of self-sufficiency); *Ecopower* (Belgium), with over 50,000 members and owning a diversity of RES power plants; *Energy4All* (UK) which comprises 15 projects with over 10,000 members and a total equity raised of £ 30 million; *Middelgrunden* (Denmark), the first offshore wind cooperative in the country, where in 1997, about 8600 local citizens jointly invested in a 10.2 MW offshore wind farm facing Copenhagen (REScoop, 2016); *EWS* (Germany) was the first civil-society initiative to take over the grid and electricity supply to a local community in the country (Schönau), and currently supplies electricity and biogas to over 160,000 members across the country and subsidizes approximately 2600 sustainable generation units (EWS, 2016). *Som Energia* (Spain) can be ranked amongst the largest RES cooperatives in Europe with over 50,000 members and over 70,000 customers around the country, owning several plants of RES electricity generation that produce over 5 GWh annually (Kunze and Becker, 2014; Som Energia, 2018).

In Spain, unlike in other countries of Europe and despite the rapid success of *Som Energia*, the modern RES cooperative movement is at an early stage of development. As a result, the academic literature analyzing this phenomenon in the country is scarce to date (Riutort Isern, 2015; Romero-Rubio and de Andrés Díaz, 2015). In this paper, the historical development of energy cooperatives in the country from the 19th century to the recent wave focusing on RES is reviewed, with the aim of assessing their potential as an effective instrument towards a democratic, sustainable and decentralized RES transition in Spain. Since Spanish RES cooperatives focus mainly on electricity, the recent developments in the Spanish electricity sector are also reviewed. To do so, the Multi-Level Perspective (MLP) is applied, which is a framework for analyzing socio-technical transitions, taking into account the role and capacity of the actors in the regimes as they dynamically react to potential changes threatening the status quo (Geels, 2014, 2010, 2002; Smith et al., 2005). Hence, the confrontation between the RES cooperatives emerging movement and the Spanish socio-political context is analyzed. Spain can be regarded as an interesting case study since, unlike other European countries, modern RES cooperatives have recently arisen in a hostile regulatory and economic context, creating particular organizational and operating structures to deal with the regime's resistance (Haas, 2014; Riutort Isern, 2015). Moreover, Spain benefits from a large RES potential in comparison to other EU countries, especially for solar, due to its southern location.

The remainder of the paper is structured as follows: Section 2

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