

## Energy for All

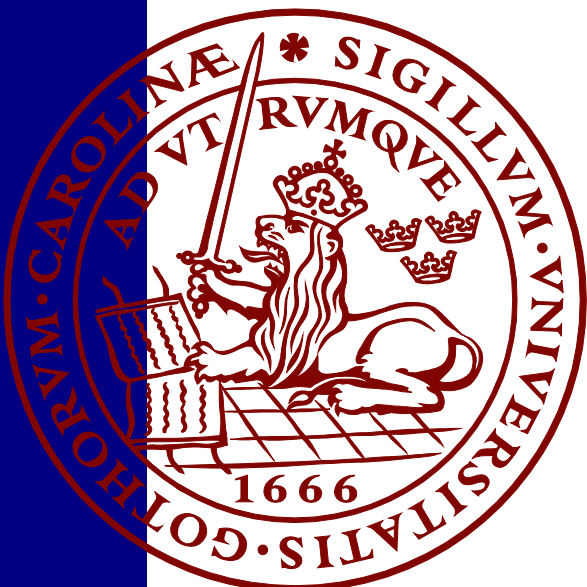
*A case study of the role of renewable energy cooperatives in the energy transition in Catalonia, Spain*

*Maria Pascual i Sánchez*

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A thesis submitted in partial fulfillment of the requirements of Lund University  
International Master's Programme in Environmental Studies and Sustainability Science  
(30hp/credits)



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## **Energy for All**

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in Catalonia, Spain

Maria Pascual Sánchez

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Submitted September 28, 2022

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## **Abstract**

Rushed efforts for a decarbonisation of the energy sector in Catalonia, Spain have been received with local opposition towards renewable energy projects. It has also raised a debate around the new energy model and whether it will perpetuate the lack of agency of civil society in the energy sector as well as the vulnerable situation some people are currently facing. This thesis examines whether renewable energy cooperatives can contribute to a fair and inclusive decarbonisation of the Catalan energy sector. Framed by energy poverty theory, the analysis shows cooperatives are bringing innovative initiatives that, coupled with a behaviour based on values of cooperation, equality and inclusivity, among others, hold much potential for shifting the energy paradigm towards one where renewable energy is treated as an essential and public good. The thesis also reflects on the limitations and challenges cooperatives face in the fight against energy poverty and in renewable energy democratisation and decentralisation.

**Keywords:** renewable energy, energy transition, energy poverty, energy cooperatives, Spain

**Word Count:** 11,940

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## **Abbreviations**

**EC** Energy Community

**EE** Energy Efficiency

**EP** Energy Poverty

**ET** Energy Transition

**EU** European Union

**GHG** Greenhouse Gas

**PVPC** Precio Voluntario para el Pequeño Consumidor (Voluntary Price for the Small Consumer)

**RE** Renewable Energy

**RES** Renewable Energy Sources

## 1. Introduction

To mitigate the impacts of climate change and limit global warming to the desired 1.5 °C compared to pre-industrial levels, further action needs to be taken to decrease greenhouse gas (GHG) emissions (IRENA, n.d.; UNFCCC, n.d.). An urgent step towards this goal is the global decarbonisation of the energy sector through an energy transition (ET), where “renewable energy (RE) and energy efficiency (EE) measures can potentially achieve 90% of the required carbon reductions”(IRENA, n.d.).

Energy poverty (EP) is a global issue, yet situational and geographically diverse, and its relationship to climate change is often misunderstood (Manjon et al., 2022). According to Meyer et al. (2018), EP is a dynamic, complex, and multifaceted phenomenon with social justice implications, as well as “a critical issue in ensuring an inclusive transition that does not leave the most vulnerable people behind”. Exacerbated by the impact of the COVID-19 pandemic, EP is thus an urgent matter to tackle (Meyer et al., 2018; Miteco, 2021).

In an effort to accelerate the ET, Catalonia published a decree that opened the floor to a high amount of macro proposals by big energy companies, which raised a heated debate around the desired energy model and caused great local opposition and a strong Not In My Backyard (NIMBY) effect (Calero, 2021). A rushed decarbonisation of the energy sector that does not re-design the energy model into one that accounts for fairness, equality, inclusivity, agency and sustainability, inter alia, has the risk of perpetuating the present EP and vulnerability situation of many households.

Renewable energy sources (RES) cooperatives have been generally found to be resilient to crisis, thus being more sustainable in the long run (Heras-Saizarbitoria et al., 2018). In some European Union (EU) states, they have been recognised as an important player in the ET, however, they are still a minority within the Spanish and Catalan energy sector. This is due to several legal, economic, technical and cognitive barriers, which leaves the electricity market in the hands of a few private companies (Heras-Saizarbitoria et al., 2018; Pérez-Suárez et al., 2021). Cooperative members have been found to have similar cultural and demographic profiles, with a high education level and social and environmental

awareness (Capellán-Pérez et al., 2018; Pérez-Suárez et al., 2021; Piterou & Coles, 2021). The limited presence along with the homogeneity of members could be detrimental to an inclusive and fair ET.

There is a lack of scientific literature about the inclusivity of Catalan RES cooperatives, as well as their tools and limitations in fighting EP. Thus, this research aims to explore the role of RES cooperatives in the context of the Catalan ET, and to investigate the present initiatives and challenges regarding EP alleviation. While directly engaging with cooperative members as potential actors of the transition, this thesis tries to provide a case study of the ET in the context of Catalonia, building knowledge on previous studies and on EP theory, ultimately contributing to the broader field of sustainability science.

This thesis seeks to answer the research question (RQ): *Can RES cooperatives contribute to a fair and inclusive decarbonisation of the energy sector in Catalonia?* through the following sub-questions:

- ❖ **SQ1:** *How inclusive are existing cooperatives?*
- ❖ **SQ2:** *How do they contribute to fighting energy poverty?*

## 2. Background

### 2.1. Energy Transition

#### ***2.1.1. European targets and directives for a socially fair energy transition***

*“The challenge at the heart of Europe's green transition is to make sure the benefits and opportunities that come with it are available to all, as quickly and as fairly as possible” (European Commission, 2021b)*

Following the framework of the Paris Agreement and aiming at overcoming the challenges of climate change and environmental degradation, the European Green Deal will ensure three things: “no net emissions of greenhouse gases by 2050; economic growth decoupled from resource use; and no person and no place left behind” (European Commission, n.d.-a). It claims “the [energy] transition can only succeed if it is conducted in a fair and inclusive way” (European Commission, 2019b, p. 16). The deal is codified in the European Climate Law, enforced 29 July 2021, which aims to keep energy prices affordable and reduce vulnerability to climate change (European Commission, n.d.-b, 2020).

A 55% reduction of net emissions of GHG by 2030 (compared to 1990 levels) binding target is set, as a prior step to reaching climate neutrality by 2050 (European Commission, 2021b). Additionally, the revised Directive 2018/2001/EU sets the target of at least 32% of RE in the total share of gross final energy consumption by 2030 (European Commission, n.d.-e). Reaching those targets is seen as an opportunity for addressing EP and reducing external energy dependency (European Commission, 2021b).

Aligned with these targets, in 2019 the EU introduced the Clean Energy Package in an effort to decarbonise the EU's energy system, where all aspects take into consideration EP mitigation objectives (Bosseboeuf et al., 2020; European Commission, 2019a). In its revised RE law, renewable energy communities are identified as an important tool for fighting against EP and Member States are asked to make possible the participation of vulnerable households (European Parliament, 2018).

The European Green Deal recognises that climate policies carry the risk of putting further pressure on already vulnerable households (European Commission, 2021b). Article 28 of the EU directive 2019/944 on the electricity market states that “Member States [...] shall ensure, in particular, that there are adequate safeguards to protect vulnerable customers. [...] each Member State shall define the concept

of vulnerable customers which may refer to energy poverty [...]” and “Member States shall take appropriate measures, such as providing benefits by means of their social security systems to ensure the necessary supply to vulnerable customers, or providing for support for energy efficiency improvements, to address energy poverty [...]” (European Parliament, 2019). This means that measures for protection are open for every state to determine in their own terms.

### **2.1.2. The Spanish electricity sector**

The Spanish climate policy is framed and bound by the EU climate policy and the Paris Agreement, thus Spain has pledged to meet the 2030 and 2050 targets (IEA, n.d.; Miteco, n.d.-d). However, Spain is still highly dependent (73% in 2021) on foreign energy sources, which affects its energy security (IEA, n.d.). 46.7% of national electricity production came from RES in 2021 (REE, n.d.). Regarding energy consumption, 21.2% came from RES in 2020, meeting the EU 2020 target (Miteco, n.d.-b).

RE production in Spain has been mostly dedicated to electricity generation, and it has had a turbulent history (Alonso et al., 2016). 1997 brought the liberalisation of the electricity sector, which opened up the generation and retailing sectors to competition. Simultaneously, a promotion of RES emerged, though Spanish society showed a passive attitude towards them (Capellán-Pérez et al., 2018). However, the 2007 economic crisis manifested the failures of the liberalisation process, such as the lack of transparency or the oligopoly of the sector, and in 2012 subsidies to new RES installations were suppressed and the promotion of RES abolished (Capellán-Pérez et al., 2018). Not until a decade later was RE boosted again by the Spanish government in an effort to accelerate the ET and meet the European targets (Miteco, 2020b).

Following the European model, the Spanish wholesale electricity market is a price-setting marginalist market<sup>1</sup> (OMIE, n.d.). When the conditions are optimal for high RE efficiency, the matching price will be low, because more costly sources will not be needed (European Commission, 2021a). However, in low efficiency RE conditions, or external factors like higher demand or instabilities, the matching price will be exceptionally high, as costly sources will be needed. Then, RE will be sold at the high price of fossil

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<sup>1</sup> The price of electricity is set every hour by the intersection between offer and demand, with a maximum offer price of 180 €/MWh. All offers lower than the intersection point are accepted but sold at the matching price (Aleasoft, 2019; Endesa, n.d.; OMIE, n.d.).

sources (including CO<sub>2</sub> offsetting fees) (Rubio, 2021). This model promotes RE and lower energy prices closer to cost price, and allows smaller producers to enter the market, but it is very susceptible to external fluctuations and instabilities (Muñoz, 2021; Rubio, 2021).

The electricity sector is composed of several elements (see Table 1 & Figure 1). The only liberalised and accessible areas are the generation and supply, so RES cooperatives can only participate in these activities (Som Energia, n.d.-f). There are two types of markets: the regulated market and the free market. In the first one, the retailing price is dynamic, fluctuating with the market price, thus the monthly electricity bill is variable. In the second one, the price is fixed by the retailing company (Som Energia, n.d.-h). There are only eight companies able to operate in the regulated market, the “Comercializadores de referencia”<sup>2</sup> (COR), whereas the free market involves 691 (and growing) companies (see Appendix A, Figure A1). RES cooperatives can only work as free market entities (CNMC, n.d.; Som Energia, n.d.-h).

**Table 1.**

*Overview of the structure of the Spanish electricity sector*

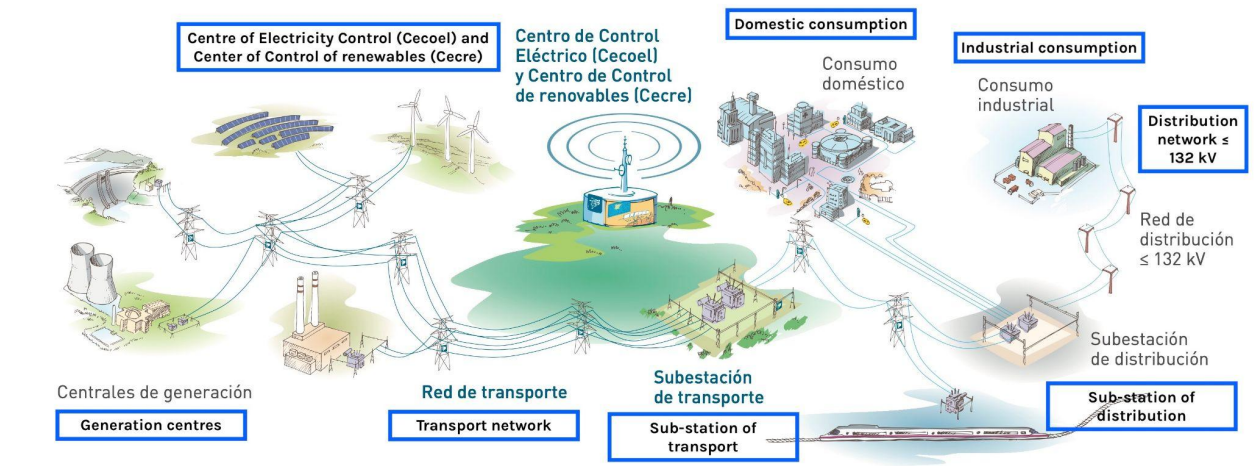
<b>Activity</b>	<b>Description</b>	<b>Liberalised?</b>
<b>Generation</b>	All the centres of electricity production (nuclear plants, hydroelectric power generators, PV solar fields, etc) (Som Energia, n.d.-f)	Yes
<b>Transport</b>	Electricity transmission from the production centres to transforming sub-stations through the high-tension network, which belongs to the Red Eléctrica Española (REE) (Som Energia, n.d.-f)	No
<b>Distribution</b>	The transport is continued from the high-tension network to the supply points through a medium- and low-tension network. These transport installations belong to the distribution companies, who are in charge of the network’s upkeep. There are only five distribution companies that spread throughout the Spanish territory and each household gets assigned the one operating within their area (see Appendix A, Figure A2) (Som Energia, n.d.-j, n.d.-f)	No
<b>Retailing</b>	Activity performed by the companies that buy the electricity in the wholesale market to producers and sell it directly to the customers, who are free to choose their preferred retailing company (see Appendix A, Figure A1) (Miteco, n.d.-c; Som Energia, n.d.-h)	Yes

<sup>2</sup> These eight companies belong to the five distribution companies, and also have their own branches in the free-market (CNMC, n.d.).

Note. This table presents the different activities of the Spanish electricity system and whether they are liberalised or not (own creation)

Figure 1.

Overview of the elements that make up the Spanish electricity sector



Note. This figure shows the different elements of the electricity system in Spain - generation, transport, distribution, retailing and consumption (REE, n.d.). Translated by author.

Spain has its own definition of vulnerability, as well as specific protection mechanisms and funding system. Vulnerable consumers can be: (1) regular vulnerable consumer, (2) severe vulnerable consumer, and (3) vulnerable consumer at risk of social exclusion. For each, specific conditions regarding household income, number of family members and pensioner status, among others, are applied (Gobierno de España, 2017; Miteco, n.d.-a). To be considered vulnerable, it is required to have the “precio voluntario para el pequeño consumidor” (PVPC), an electricity contract with one of the COR, which fluctuates daily with the market and does not include additional costly services (Gobierno de España, 2017; Miteco, n.d.-a).

Vulnerable consumers are encouraged to ask for the “bono social eléctrico”- electric social bonus- a discount on the electricity bill that only people considered vulnerable (having the PVPC and being clients of a COR) can benefit from. The social bonus applies a 25%, 40% and 100% discount on the electricity bill of the different kinds of vulnerable consumers, respectively (50% of the bill of the former is paid by social services). Additional discounts are in place due to the COVID-19 pandemic and will last until 31

December 2022 (Miteco, n.d.-a). Alongside the specific tariffs as protection mechanisms, there are ensuring procedures in case of supply cuts to vulnerable households receiving the social bonus (Miteco, n.d.-a). The beneficiaries of the electric social bonus can also benefit from the “bono social térmico” - thermal social bonus-, an annual payment for vulnerable consumers to help them with thermal energy services (Miteco, 2020a). These measures, however, have proven to be insufficient in solving EP in Spain (Barrella et al., 2021).

The protection mechanisms are funded by the entities that participate in electricity supply (Gobierno de España, 2017). This is ultimately paid by the consumers through an element in the electricity bill. Not only the eight COR offering the social bonus contribute to its funding, but also all the other 691 free-market companies that are not allowed to provide it (Som Energia, n.d.-d).

### **2.1.3. The Catalan energy transition**

Catalonia, as one of the 19 Spanish Autonomous Communities, must have its energy policies in line with the agreed Spanish targets. The “Generalitat de Catalunya” (Catalan government) has shared competencies in the management of RE and EE, as well as in environmental protection matters (Generalitat de Catalunya, 2021).

Catalonia aims to cover 50% of the total electricity demand with RE by 2030 (Generalitat de Catalunya, 2017). Yet, in 2021, RE only represented 15.5% of the total share (Observatori Renovables, n.d.). Currently, Catalonia has a mainly fossil energy model that imports most resources from third countries (Generalitat de Catalunya, 2021). Despite being one of the most densely populated regions in Spain, making up 16% of the total population, Catalonia only represented 6.5% of the total share of installed RE in Spain in 2021 (INE, 2022). The lack of presence of renewables and delay in achieving the energy targets are due to several factors, including the former paralysation of RES promotion and problems to develop new RE installations, together with a late initiative to work towards the ET.

Article 19 of the Climate Change Law 16/2017 (2017) established that “measures taken in energy matters need to be directed towards the transition to a 100% renewable energy model [...] that decreases the vulnerability of the Catalan energy system and that guarantees the access to energy as a common good”. However, it was not until 2019, with the approval of the Decree No. 16/2019 on *Urgent measures for the*



*climate emergency and the boosting of renewables*, which modified the previous law, that RE was promoted again and accelerated efforts towards the transition were made (Generalitat de Catalunya, 2019). This decree simplified the authorisation process for new RE installations in specific areas without the involvement of the local communities, which meant a high land demand (Colafranceschi et al., 2021; Generalitat de Catalunya, 2021).

This problem created several deferrals and motions of the Catalan Parliament, which stressed the need of having a social dialogue in the unfolding of RE implementation and prioritising projects by closeness to consumption centres (Generalitat de Catalunya, 2021). The conversation led to the issue of a new Decree (24/2021) which modified both previous law and decree to introduce measures that enhance social acceptance of RE projects (e.g. the developing entity must offer the territory to participate at least in 20% of the project property or funding), simplify administrative processes in self-consumption matters, and see to the unnecessary occupation of the territory, among others (Generalitat de Catalunya, 2021). This new decree seemed to release some tension from the local communities, but concern the installing entities about possible slowing down of projects (Cerrillo, 2021).

This back and forth between different approaches and the conflicts that appeared depict the shortcomings of the current energy system, which has failed to progress the ET in a fair and inclusive manner that accounts for both people and the environment.

## **2.2. RES Cooperatives**

The International Cooperative Alliance (ICA) defines a cooperative as *“an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically controlled enterprise”* (ICA, n.d.-b). Spanish RES cooperatives follow this definition and abide by the seven cooperative principles<sup>3</sup>, reflected in the 1999 Spanish cooperative law (Gobierno de España, 1999; Heras-Saizarbitoria et al., 2018).

The first Spanish energy-related cooperative movement (first wave) appeared in the late 19th century/early 20th century to connect peripheral regions to the national electricity grid (Capellán-Pérez

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<sup>3</sup> (1) Voluntary and Open Membership, (2) Democratic Member Control, (3) Member Economic Participation, (4) Autonomy and Independence, (5) Education, Training and Information, (6) Cooperation among Cooperatives, and (7) Concern for Community (ICA, n.d.-a)

et al., 2018). More than two thousand cooperatives emerged, mostly focused on hydroelectric power, from which only about fifteen still remain (Heras-Saizarbitoria et al., 2018). In 2010 cooperatives were allowed to retail electricity, marking the beginning of the second wave, mainly dedicated to electricity retailing from RES (Capellán-Pérez et al., 2018; Pellicer-Sifres et al., 2018). This wave emerged in the hostile context of an economic crisis and a surge of civil society activism, and different to the first wave, it was driven by environmental and social concerns (Capellán-Pérez et al., 2018; Heras-Saizarbitoria et al., 2018; Pellicer-Sifres et al., 2018).

Modern cooperatives are seen as an alternative to the oligopoly of the electricity market and as a solution to EP (Pérez-Suárez et al., 2021). Influenced by the communitarian traditions of Catalonia, emerged Som Energia, the pioneer cooperative focused both on RE production and supply (Heras-Saizarbitoria et al., 2018; Papajak, 2016; Pellicer-Sifres et al., 2018). Som Energia played a key role in enabling the flourishing of other newer and smaller RES cooperatives, which followed its footsteps (Heras-Saizarbitoria et al., 2018).

The cooperative principles are closely tied to sustainability principles, with particular emphasis on the social dimension. RES cooperatives are the entities most aligned with the values of a fair ET and the ones most likely to ensure that the transition is achieved sustainably (Piterou & Coles, 2021). They pay more attention to local energy needs, make civil society more engaged in the energy system, create closer ties between producers and consumers, allow for better local development, help mitigate the NIMBY effect, and enable space for bottom-up initiatives (Capellán-Pérez et al., 2018; Piterou & Coles, 2021).

## **3. Theoretical Framework**

### **3.1. Energy Poverty**

#### ***3.1.1. What is energy poverty?***

Different expressions have been used throughout the years to describe energy poverty, such as ‘fuel poverty’, ‘domestic energy deprivation’, or ‘energy precariousness’. However, they all refer to “the inability of a household to access socially and materially necessitated levels of energy services in the home” (Bouzarovski, 2014).

There is not a single, explicit definition of EP at EU level (Bosseboeuf et al., 2020). The Energy Poverty Advisory Hub (n.d.-f) states that “Energy poverty occurs when energy bills represent a high percentage of consumers' income, affecting their capacity to cover other expenses. It can also occur when consumers are forced to reduce the energy consumption of their households, and consequently, this affects their physical and mental health and well-being”. The EU Directive 2019/944 mentions that “Adequate warmth, cooling and lighting, and energy to power appliances are essential services to guarantee a decent standard of living and citizens' health. Furthermore, access to those energy services [...] enhances social inclusion. Energy poor households are unable to afford those energy services due to a combination of low income, high expenditure on energy and poor energy efficiency of their homes” (European Parliament, 2019).

Spain defines it as a “situation where a household is found where the basic needs for energy supplies cannot be met, as a result of an insufficient level of income and may, where appropriate, be aggravated by the availability of inefficient housing in energy” (Miteco, 2019).

#### ***3.1.3. Measuring energy poverty***

Due to its multiple dimensions, several indicators are used to measure EP, such as the inability to keep home adequately warm, the share of energy expenditure in income, the household electricity prices, the arrears on utility bills, and the poverty risk, inter alia. It is estimated that over 34 million people in the EU

suffer from different degrees of EP, which particularly affect the most vulnerable groups (European Commission, n.d.-c).

EP is more present in Southern Europe, thus in Spain, where household incomes are lower, creating higher rates of income poverty, and where homes are often poorly insulated, making them thermally inefficient (Bouzarovski, 2014; Marí-Dell’Olmo et al., 2021). The Spanish primary indicators show higher percentages of households in EP compared to the EU indicators (e.g. in 2018, 9.1% of Spanish households are unable to keep their homes adequately warm vs. 7.3% of EU households) (see Appendix A, Table A1) (European Commission, n.d.-c).

In light of the above, the Spanish government approved the National Strategy against Energy Poverty 2019-2024 (ENPE), which aims to understand and monitor EP, and to implement appropriate measures to decrease the number of households suffering from it (Miteco, 2019).

#### ***3.1.4. Hidden energy poverty and who does it affect the most***

The behaviour of self-rationing practices has been defined by Meyer et al. as “hidden energy poverty” (HEP). Many vulnerable people often restrict their energy consumption, yet the EP metrics do not tend to reflect this, but the disproportionate share of income spent on energy instead (Barrella et al., 2021). The Spanish EP indicators were updated in December 2021 to include an indicator for this element, which is measured as the percentage of households whose energy consumption is less than half of the average national consumption (Miteco, 2021).

Reflecting the stratification of modern society, EP is not evenly distributed, as it affects precarious social groups, such as single parents, lone pensioners, women above 65, low-income large families, tenants, people living in rural areas, and migrants from low- and middle-income countries (Barrella et al., 2021; Bouzarovski, 2014; Marí-Dell’Olmo et al., 2021). Further, it has been demonstrated that there is a link between Spanish unemployment and EP, alongside the failure of social safety nets for assistance to the energy poor (Bouzarovski, 2014).

### ***3.1.5. Fighting energy poverty for an inclusive energy transition***

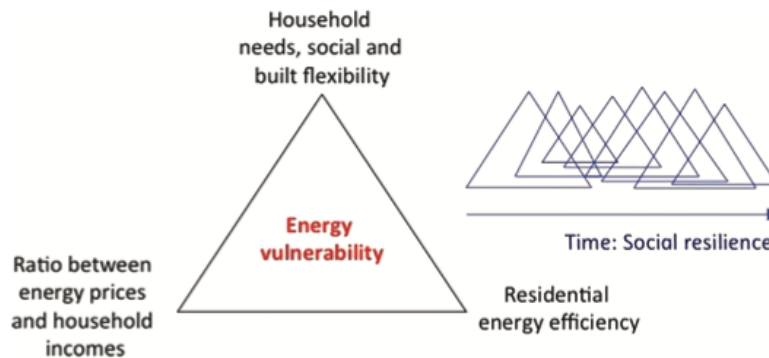
The ET is challenged by the inclusion of energy vulnerable households. Despite some progress to tackle EP, the current efforts have proved insufficient (Manjon et al., 2022). Due to its complex, often invisible and multifaceted nature, EP can be seen as a wicked problem that involves the cooperation of diverse actors, such as governments, private entities and civil society, among others (Manjon et al., 2022). Manjon et al. (2022) suggest that social entrepreneurship (i.e. energy cooperatives, inter alia), due to its collaborative nature and bottom-up approaches, has the potential to contribute to fighting EP in the context of an inclusive ET through innovative solutions for marginalised groups. Through their systematic literature review, they found that social entrepreneurs may be key in the training of multiple actors involved in EP, including an active involvement of vulnerable groups. However, research on the intersection of social entrepreneurship and EP is just emerging, and the role of the social entrepreneur is still not fully understood (Manjon et al., 2022).

### **3.2. Vulnerability Lens**

EP and vulnerability are tightly linked – several factors can make a household vulnerable to EP, and the most vulnerable groups are those particularly affected by EP (European Commission, n.d.-c; Meyer et al., 2018). Bouzarovski (2014) suggests using an energy vulnerability lens to understand EP issues (see Figure 2). Through this lens, energy deprivation is not only about poverty, access to energy and efficiency, but it includes a broader perspective that accounts for household needs, built environment flexibility and resilience (Bouzarovski, 2014). Energy vulnerability emphasises the factors that contribute to the precariousness of certain households, which ultimately affects personal wellbeing and social notions of fairness and equity (Meyer et al., 2018).

**Figure 2**

*Conceptualization of energy poverty through a vulnerability lens (Bouzarovski, 2014)*



I will use this lens to examine how RES cooperatives are acting in relation to the factors that constitute energy vulnerability, and thus influence EP. Further, Füssel (2007) notes that it is important to clearly define the vulnerable situation to avoid misunderstandings in the term ‘vulnerability’, as there are different interpretations of the term. Therefore, I will pay great attention to the different definitions of vulnerability that may appear in the study to identify potential mismatches that could exacerbate a vulnerable situation.

### **3.3. Limitations of Energy Poverty Theory and the Vulnerability Lens**

EP theory is a rather new field of research, so the amount of academic work is still limited, including understanding of the underlying causes (Bouzarovski, 2014). The lack of a common definition for it shows this. These gaps of knowledge might make the research process less straightforward, yet simultaneously leaving more space for exploration and learning.

Though EP is now measured in quantitative terms through several indicators, I am doing a qualitative analysis, therefore applying the vulnerability lens in a qualitative way. This lens is quite general and there is not much literature on it. As it considers less measurable factors such as household needs or flexibility, but also measurable ones like EE, it could be regarded as a mixed approach. I have adapted it to my study, so I will try to qualitatively identify the cooperatives’ contribution to mitigating vulnerability, thus alleviating EP.

## 4. Methodology

### 4.1. Research Design and Case Study Description

This thesis applies a case study methodology to investigate the challenges, initiatives and limitations Catalan RES cooperatives experience regarding EP within the context of the ET. Thus, the boundaries of this case study have been drawn on the Spanish autonomous community Catalonia, as this scale fits within the scope of this thesis, but is relevant enough to reveal insights on the successes and shortcomings of the transition and EP policies of the region, which affect more than 7 million people (Idescat, n.d.), and directly impact Spain's own ET.

Stemming from personal experience as a Catalan citizen myself and having had several former encounters with the topic, I conducted preliminary research to get an overview of the state of the ET and the current cooperative scene in Catalonia. This helped me identify a gap in the literature regarding the role of cooperatives in relation to EP in the context of the transition. I conducted a literature review including peer-reviewed literature, legal documents, and grey literature, as well as watched relevant videos and public documentaries available online. During the initial gathering of information, I selected the cooperatives of most interest to the study to further contact and potentially interview (see Table 2). Most replied quickly, showing great interest in the topic and a willingness to talk about it and share their opinions. This confirmed the relevance of the topic and the urgency of the need to change things. Despite the general interest, a few cooperatives did not reply. In those cases, I consulted their websites and used the information publicly available online.

**Table 2.**

*List of consulted cooperatives for the research (own creation)*

<b>Cooperative</b>	<b>Information &amp; Details</b>	<b>Data obtained from</b>
Som Energia	A state-wide RES cooperative that does both production and retailing of electricity, along with many other projects. Born in 2010, it is the first RES cooperative in Spain, with around 80,000 members	Interviews, empirical material, online resources & website

Balenyà Sostenible	A newly established (2021) RES cooperative and energy community developing a collective energy self-consumption project in the municipality of Balenyà	Interview & website
Som Confort Solar	A local RES cooperative based in Sabadell that focuses on RE installations and engineering projects	Interview & website
Suno	Cooperative born in 2015 and formed by a team of engineers specialised in RE that carry out energy consulting services and learning about RE, among others	Website
Pinergia	A small cooperative born in 2015 doing projects related to engineering, installations and energy efficiency in the Pyrenees area	Website
Azimut 360	A cooperative focused on RE installations, energy consulting and project management, among others	Website

For data collection, first I conducted online semi-structured interviews to several cooperative members (see Appendix B, Table B1). Additionally, I was given extra resources from some participants, which I also used as empirical material (see Appendix B, Table AB). Then, I analysed the interviews, together with the information from the cooperatives' websites, and the extra empirical material, through a thematic analysis to answer the RQs (see Table 3). I performed triangulation, using more than one source of data to answer the RQs, to enhance the credibility of the research (Bryman, 2012, pp. 392–396).

**Table 3.**

*Outline of the research design*

	Research Question	Data	Method
<b>SQ1</b>	<i>How inclusive are existing cooperatives?</i>	Interviews, literature, websites & extra empirical material	Thematic analysis and literature review
<b>SQ2</b>	<i>How do they contribute to fighting energy poverty?</i>	Interviews, literature, websites & extra empirical material	Thematic analysis and literature review
<b>Main</b>	<i>Can RES cooperatives contribute to a fair and inclusive decarbonisation of the energy sector in Catalonia?</i>	Findings from SQ1 & SQ2	Critical discussion



*Note.* The table shows which data and methods were used to answer the RQs (own creation)

## **4.2. Data and Analysis Methods**

### ***4.2.1. Literature review***

I performed a literature review to provide the contextual base and help define and refine the RQs (Biggs, 2021, p. 86). The databases used to find the literature were Google Scholar, Scopus and LUBsearch. I conducted the review by selecting relevant papers to the topic of study (Bryman, 2012, pp. 97–129). Then I defined the relevance by the spatial boundaries of 1) Catalonia and 2) Spain. These included articles about the energy sector, the ET, and RES cooperatives, as well as general theoretical literature on EP. I paid special attention to case studies of Spanish or Catalan RES cooperatives and recent articles on the ET and its changing policies. I used the literature review to design the interview questions (see Appendix C), together with the theoretical lens in mind, and to answer the RQs, together with the results of the thematic analysis.

### ***4.2.2. Semi-structured interviews***

The main reason for conducting interviews in this study was to directly get the point of view of the interviewees, both regarding their opinions and their experiences (Edwards et al., 2014, p. 111). I chose the method of semi-structured qualitative interviews as these offer more freedom when shifting the order of questions or asking additional ones (Bryman, 2012, pp. 468–500). I interviewed all participants via Zoom, as this method was the most convenient for time and schedule reasons, and recorded them with their consent. The recording allowed me to be fully attentive and able to steer the conversation in the desired direction when needed, instead of being too focused on taking detailed notes. Each interview lasted around 45-90 minutes, and I transcribed it afterwards. The transcription allowed me to perform a deeper analysis of the interviewees' answers, and helped me correct some biases that would occur when recalling from memory (Bryman, 2012, p. 482). I did the interviews in Catalan, which allowed the interviewees to express themselves freely and fluently in their mother tongue. At the end of the interviewing process and thanks to the continuous transcribing, I reached a point of data saturation and redundancy for most items of interest.

### **4.2.3. Thematic analysis**

Once I gathered the data, I applied a thematic analysis approach, which is useful to identify patterns or themes within a set of data (Biggs, 2021, p. 274). I chose this strategy as it was appropriate for discerning common perceptions and mapping existing challenges. To perform the analysis, I combined deductive and inductive coding (Bryman, 2012, pp. 24–26). I started off with a general set of codes that included 1) energy poverty, 2) cooperatives, and 3) energy sector. These codes were selected *a priori* based on the literature review done before the interviews. After familiarizing myself with the data through transcription, reading and revision, I started the inductive process by creating more detailed codes for each of the categories mentioned above, based on their relevance for answering the RQs. This way, each of the three general categories had several subcategories (see Appendix B, Table B3). The analysis process was not linear or straightforward. I went back and forth with the codes, refining them each time I transcribed a new interview. I continuously checked for recurrence in them to identify the themes, aiming for the reduction of data to the essential ideas and notions (Bryman, 2012, p. 13). Lastly, I tried to be as self-reflexive as possible by taking notes and observations after each interview, journaling through the data collection process, and tracking and organising all the gathered information.

### **4.3. Limitations**

Due to the dynamic nature of the topic, the ongoing effects of the COVID-19 pandemic, and the war in Ukraine, some energy policies and mechanisms have been in the process of changing during the last stages of this study. I conducted the interviews before the implementation of such changes, which will most likely take some time to manifest. Further, the data collected involves collective experience over the years, thus I analysed the results within the timeframe of the study. However, the implications of certain changes will be discussed as well.

### **4.4. Positionality**

To strive for transparency, I would like to express some reflections on my role as a researcher. First, I am aware that when choosing to do research in Catalonia, me being Catalan and having lived there most of my life, thus understanding the political and social context, enabled me to get access to some information that would otherwise have been difficult to get. Speaking in Catalan with the interviewees

allowed me to build trust more easily and detect more nuances in their answers. I tried to be as neutral as possible when discussing energy sovereignty and Spanish policies, as they can sometimes raise the debate about Catalan independence. I made sure to be careful when discussing EP, which often brings forth the delicate topic of privilege. When approaching people as a sustainability science student from an international university, I was met with a surprisingly positive response and a good disposition to talk. They wanted their stories and problems to be heard, and while I was coming to them with a critical eye, I found most of them to be as critical as me and with a burning desire to change things.

## 5. Results

A general finding was that Som Energia is one of the most critical cooperatives, and the one that does more information outreach. As it is also the biggest and oldest one in Catalonia, I have collected more data from it than from other cooperatives. Even other ones mention Som Energia in the interviews, which seems to make Som Energia a representative RES cooperative in the Catalan context and a role model for other upcoming ones.

### 5.1. Cooperative Members

#### 5.1.1. Members' profiles

Previous research found that cooperative members hold a homogeneous cultural and demographic profile (Pérez-Suárez et al., 2021). This was partly confirmed on my research, as different members of Som Energia stated that most people joining the cooperative have a certain economic status, age and cultural background (SE-3a; SE-3b; SE-1). I also noticed differences in the involvement of members: some want to participate in projects, collaborate with it, or buy electricity, while others do paid work.

Most members did not have any difficulties to pay the electricity bill prior to joining the cooperative (SE-1). SE-3b emphasises that in Spain, people start living on their own quite late, so age definitely plays a role when becoming a property owner and having your own electricity contract, thus influencing the age range of members.

SCS mentions there are not many migrant people in the cooperatives, to which SE-3a adds that more than half of Som Energia's members are Catalan (the rest are from other Spanish regions, and a small proportion from other countries). The spatial distribution of members is also uneven, as the cooperative world is centred around cities and densely populated areas (SCS). Around 75% of Som Energia's members are located along the Mediterranean coast (SE-3a).

SCS, SE-3a, and SE-3b note there is gender inequality in the cooperatives, especially in the "consell rector"<sup>4</sup> and local groups of Som Energia, both with voluntary members, and in cooperatives with a more engineering profile like Som Confort Solar. As seen from other cooperatives' websites, there is always

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<sup>4</sup> Group in charge of implementing the directives established in the assemblies (Som Energia, n.d.-I)

more presence of men than women, though sometimes the working teams are so small that it can be difficult to discern how representative they are in terms of gender (Azimut360, n.d.; Pinergia, n.d.-b; Suno, 2018c). With regard to the management of Som Energia, the working team (paid work) is quite balanced (46 women and 55 men) (Som Energia, n.d.-l). It is relevant to note that Som Energia is making a big effort in always referring to their members as “sòcies”, the feminine form of member, normally addressed by the masculine one.

Som Energia also focuses on language diversity within Spain, trying to provide all information in the four co-official languages in Spain - Spanish, Catalan, Galician, and Basque - so that everyone feels included (SE-3a).

### **5.1.2. Member's contribution**

A recurrent thing that came up in the interviews was the member's contribution, which differs from one cooperative to another and is returned if the member leaves (Balenyà Sostenible, 2021; Som Energia, n.d.-g).

To become a member of Som Energia one must contribute with 100€, which gives you access to the many projects from the cooperative but does not bind you to it as an electricity supplier (SE-1). Some people might want to buy the electricity from them, but may not have a 100€ to spare at the moment. That is why Som Energia allows each member to have up to five contracts in their name that can be used by other people that do not need to pay the contribution (SE-3b; SE-3a; Som Energia, n.d.-a).

For Balenyà Sostenible, the member's contribution is 50€, a more accessible amount, asked to show commitment with the cooperative (Balenyà Sostenible, 2021).

### **5.1.3. Reasons for joining and outreach**

A survey conducted by Som Energia in 2017-2018 to its members (EM1) showed that 34% of them joined to give support to RE, followed by 28% that joined because they were fed up with big electricity companies. Other reasons were to give support to the cooperative economy (18%) and because someone recommended it to them (12%). Lastly, only 5% of them joined because it was a cheaper

alternative to their current contract (EM1). As seen from the survey, becoming a member of a RES cooperative does not necessarily mean that the person is pro-environmental, or they join as a reaction to the electricity market oligopoly, though these motivations do make up the majority of reasons.

One of the cooperatives' strength is the bond created with the members, which builds trust and does not happen with big energy companies (SE-3a). Such transparent relationship can be a decisive factor for joining.

Som Confort Solar has found difficulties in attracting people, as being a member entails having certain responsibility over the management of the cooperative (SCS). The cooperative's task force involves both members and non-members, yet for members activism and work overlap sometimes, which may lead to working overtime or contributing economically in times of crisis. Yet, being a member also allows for a more flexible schedule and a less strict working dynamic (SCS). In contrast, Som Energia's members do not have any legal responsibility, facing only the risk of losing the initial member's contribution if the cooperative crashed (Som Energia, n.d.-g).

Another survey from Som Energia asked their members the way they had discovered the cooperative (EM2). 47% of them had found it through family members, friends and neighbours, and 19% had discovered it through its website. The most powerful tool for growing and reaching people, as expressed by SE-3a and confirmed by the survey, is word-of-mouth.

One of Som Energia's big challenge is attracting people with more diverse profiles (SE-3b). To overcome it, they are always available for questions, working through social media, talks, workshops, the blog, the 'Aula Popular'—an online space to share knowledge and collectively learn about energy-related topics—and the Local Groups, which have proved to be a really powerful tool as their members are locally known and trusted (Som Energia, n.d.-a; SE-3a; SE-3b).

## **5.2. Challenges and Tools to Fight Energy Poverty**

Som Energia emerged with the aim of being a citizen tool to accelerate the ET (Comas, 2022). Unless all stakeholders are empowered in the transition, a few powerful actors will dominate the process and instabilities will be present (Alonso et al., 2016).

I found RES cooperatives not only aim to produce or supply RE to decarbonise the energy system, but they also aim to alleviate EP and empower people through learning about energy. However, they are facing some challenges and limitations. To understand these, first we need to understand how vulnerable consumers fit within the energy system, and how do the current policies against EP affect RES cooperatives.

### ***5.2.1. Energy poverty and the vulnerable consumer***

As SE mentions, nowadays, EP drags all the other poverties. Each day we see more people struggling to meet their energy needs, making visible a side of EP that was more subtle before, and the Spanish targets set for 2025 seem quite far still (see Appendix A, Table A1 & A2). After the COVID-19 pandemic, it became more evident that if people do not have access to electricity, they might be unable to work or receive education (SE). Recently, as a result of the skyrocketing energy prices due to the Ukraine war, people have found difficulties in commuting to work, heating their homes or even doing laundry. If access to energy is not guaranteed, well-being and quality of life are compromised, further perpetuating the poverty cycle (SE).

Regarding EP, there is an intersection between energy and social services competences, and between state and autonomic policy (SE). Catalonia holds the social services competencies and has shared competencies in some energy matters, though the state has most of them (SE). As a result, regulations are many times unconnected, which creates some legal holes and insecurity for vulnerable people, as well as obstacles for non-profit initiatives like Som Energia that are trying to fight EP (SE; EM3).

As previously mentioned, the main mechanisms to fight EP in Spain are the specific tariffs (PVPC and social bonus) and the ensuring procedures in case of supply cuts. Highlighted by SE, the Spanish definition of vulnerability that allows someone to receive the social bonus includes the supply company. This definition entails having the PVPC, which can only be offered by the eight COR (Article 3, Gobierno de España, 2017; SE). Therefore, seen from the Spanish perspective, someone that gets their energy from any other free market company, including the cooperatives, will never be able to benefit from the social bonus, because they do not have the PVPC, and thus are not legally considered vulnerable (SE). As

Som Energia expresses on its website: “people that hire a free market retailing company lose the opportunity of benefiting from an aid to which they are entitled to” (Som Energia, n.d.-d).

Moreover, Spanish vulnerable consumers are affected by the fluctuations and high prices of the energy market, as the regulated price of energy, to which the PVPC is bound, is dynamic—thus dependent on the market price (SE). Spain is the only country of the EU that has this mechanism, hence the Spanish vulnerable consumer is less protected against EP than the average European one (SE).

Lastly, a vulnerable consumer getting energy from a COR, will never be able to choose the company they want, as one gets assigned the supplier that provides for each territory (SE). None of these companies provide a 100% RE mix, so the consumer will not be able to pick their energy mix either. Thus, a vulnerable consumer suffers discrimination from lack of choice of company and energy mix (SE).

### ***5.2.2. Problems of the funding mechanisms and the Catalan vulnerability definition***

The funding mechanism for the social bonus particularly affects retailing cooperatives like Som Energia. The fact that a small percentage of the population is supporting it makes this mechanism unstable, as if the number of vulnerable people keeps growing, the mechanism will fail (SE).

In 2021, Som Energia contributed with 394.000€ to the funding of the social bonus, yet they were not allowed to offer it (EM3). SE says it is not fair the cooperatives are paying the COR, so these can provide a cheaper contract to their vulnerable clients, who cannot receive a green mix of energy, select their energy supplier, or receive Som Energia’s (or any other cooperative) quality customer service. Ultimately, the money comes from the cooperatives’ members through their bills, who will never be able to benefit from a reduced fee like the social bonus (SE). As SE said:

*“The poor pay the poor”*

Catalonia issued a law in the EP front from its social services competences (Generalitat de Catalunya, 2015). The intentions are good, as it aims to prevent energy companies to cut off the supply to consumers considered vulnerable by social services. But the issue, along with the lack of budget assigned, is that this vulnerability definition does not match the state definition of vulnerability (SE;



EM3). According to the law, a member of a cooperative *can* be in a vulnerable situation, contrary to what the Spanish law dictates. The adopted mechanism is ‘positive silence’, meaning if the consumer does not reply in a situation of non-payment, it is automatically considered vulnerable and therefore, their electricity supply cannot be cut off (SE).

As a result of this law, Som Energia find themselves in a complicated situation, as they are paying double: they fund the social bonus as required without being able to offer it, and they also cover the costs of unpaid bills of vulnerable clients according to Catalan law (SE). Though Som Energia tries to help them get the social bonus, many do not want to do it, as they know the cooperative is trust-worthy, has good customer service, and provides a 100% RE mix (SE; Som Energia, n.d.-h).

### ***5.2.3. The temporality of energy poverty and public aids***

SE-1 noted that EP is not usually a permanent state, but rather a temporary situation. This is also reflected in the way the social bonus works: it is active for a period of two years, after which it can be consecutively renewed for two more if the consumer still meets the required conditions (Article 10, Gobierno de España, 2017). SE-1 indicates the best strategy to reach and help vulnerable households would be through shared self-consumption initiatives, where a public or private entity, preferably a municipality or EC, does a big installation where many people buy a small share of the energy for a much lower price than the market one. Through these initiatives, the community can collectively and continuously decide the best way to help households in a situation of vulnerability (SE-1, SE-2).

However, individual self-consumption projects are more favoured by the administration (SE-3a; SCS). Currently, there are two kinds of public aids: (1) municipalities give households installing PV panels a 30-50% discount on the IBI<sup>5</sup> during the first years, to help pay off the initial investment; and (2) aids from the NextGeneration<sup>6</sup> funds that Catalonia chose to use to directly subsidise PV installations (SCS; SE-3a). With these aids, whoever is doing the installation always has to pay first, limiting the benefits to privileged people with property that already have enough capital to invest (SCS; SE-3a; SE-1).

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<sup>5</sup> Impuesto sobre Bienes Inmuebles (property tax)

<sup>6</sup> It is “the EU's €800 billion temporary recovery instrument to support the economic recovery from the coronavirus pandemic and build a greener, more digital and more resilient future”, from which Spain has received 140,000 million euros (European Commission, n.d.-d; Ministerio de Hacienda y Función Pública, n.d.).

#### **5.2.4. Tools, initiatives, and limitations**

##### ***Learning***

Different members of Som Energia emphasized how they do not aim to make profit, but rather raise awareness about energy consumption patterns and empower people to learn about EE, so they can reduce their energy expenditure, instead of just changing provider (SE-2; SE-3a; SE-1). They send their members every couple of months a newsletter (*Infoenergia*) informing them about their latest maximum power consumption, so they learn about how much energy they actually need (SE-3a). Pinergia and Suno offer EE studies to optimize energy supply and therefore reduce consumption and expenditure (Pinergia, n.d.-a; Suno, 2018a). Suno also gives workshops to schools, professionals and the public administration about energy billing, saving, and efficiency (Suno, 2018b).

Further, Som Energia offers a free course about tools for fighting energy vulnerability (EM3). Its aim is to make the issue more visible to society, provide resources for people at risk of being in a vulnerable situation, and give information on how to take action as a citizen (EM3). SE-2 also mentioned that a project about EP is in the early stages of creation, which will be about the tools that the cooperative could have and the actions it could take on that front.

##### ***Energy Communities***

Energy communities (EC) are initiatives holding great potential for giving people agency and enhancing local acceptance of RE projects (European Parliament, 2018). In Spain, EC can have the legal form of associations, cooperatives, foundations, etc, but there is not a legal entity called “energy community” yet. The activity of supply is only allowed to trading companies and cooperatives, so if an entity acting as an EC wants to do such activity, it must have one of those legal forms (SE; EM4).

Som Confort Solar is involved in a new EC project, Covadonga, also in collaboration with the Sabadell Local Group of Som Energia. The project consists of a shared PV installation on a municipal space to provide energy for around 50 households (L'Eixida, n.d.; SCS). The participants would assume the installation cost and cover the costs of those few participants unable to pay. All decisions would be discussed internally to avoid mistrust (SCS). However, the municipality has presented some difficulties in

the realisation of the project due to many spaces affected by urban planning, and Som Confort Solar has not been able to participate as much as they would like to due to economic and time constraints (SCS).

Some members of the Lleida Local Group of Som Energia are independently developing an EC with the legal form of association that aims to do a PV installation in the town hall and gym roofs (SE-1). The participants will be able to have their energy supply with the company of their choice, while getting a discount on their energy bill in exchange for the surplus production from the solar panels. Hence, vulnerable consumers will be able to receive the social bonus while participating in the EC (SE-1).

A different initiative is Balenyà Sostenible, aiming to fund the installation of PV solar panels on municipal roofs without its member's economic contribution, funding them through a banking institution instead (BS). The intention of Balenyà Sostenible is "to incorporate alternative systems, achieve a reduction in the energy bill, and promote a green and sustainable economy", as well as promoting good relationships among neighbours (Balenyà Sostenible, n.d.). They do not want to fund the installation through their members because that would limit the access to some households. Though getting funding this way might prove challenging, they believe it to be the most ethical way of creating an EC, and worth to be replicated (with modifications to fit the context) in other areas of Catalonia (BS). In exchange for the municipal allowance, Balenyà Sostenible will give the municipality 10% of the generated energy, which will be destined to helping households in a vulnerability situation, informed by social services (BS). If there were no vulnerable households within the 500 m radius imposed by the legislation, the surplus energy would be directed towards municipal installations (BS). At the beginning they will probably not have enough energy for all households, but they hope to slowly expand the installations, and even try wind power, district heating with biomass energy, or shared mobility in the future (BS).

### ***Voluntary cent***

Som Energia also contributes to fighting EP through the 'voluntary cent', a 0.01€ donation for every spent kWh (approximately 3€ every month per household) used for the development and improvement of the cooperative (Som Energia, n.d.-e). As Som Energia's by-laws explicitly state, the cooperative wants to make an effort to alleviate EP, so the money is sometimes destined to EP-related projects directly involving the Local Groups (SE-1).

A great example is “Llars del Seminari”, a social inclusion project carried out by the Lleida Local Group, together with a local foundation, consisting of a RE installation in a building for people at risk of social exclusion (SE-1; Casadellà, 2018). The beneficiary of the installation is the entity managing the flats, but as the dwelling's energy costs significantly decreased, this positively affected the households' electricity bills, saving around 30% of the total cost annually (Casadellà, 2018). Thus, despite the entity being the owner of the installation, the ones who benefit are the tenants (SE-1).

### ***Collective purchases***

Another tool is Som Energia's self-production collective purchases, where a free installation is provided to a non-profit entity or community in every purchase (SE-2; SE-1). A group of people living in the same area, through Som Energia, get to buy and build RE infrastructure for self-consumption (Som Energia, n.d.-c).

The participants tend to be in a privileged position that allows them to purchase the installations (SCS; SE-1; SE-3a; SE-2). They are usually house owners too, as a requirement to participate is to have your own roof (Som Energia, n.d.-c). As SE-3a expresses, it is a vicious cycle, where some people will never be able to afford it, so they will not get the benefits of having their own energy production, thus having to rely on the market.

Despite the narrow profile of users, the free installation is a positive step in the fight against EP that can inspire other communities to do the same. A good example is the gifted installation to the Marpi Foundation, a non-profit and socially committed entity working with social and occupational integration of people with intellectual disabilities (Som Energia Maresme-Selva Marítima, 2022). By helping social entities like this one reduce their energy expenditure, it allows them to direct more resources towards social inclusion and justice, while reducing their fossil energy consumption, ultimately contributing to a more fair and inclusive ET.

### ***Germinador social***

Som Energia collaborates with Coop57 since 2017, a cooperative that provides ethical and solidary financial services, in a project called “Germinador social”, a contest based on popular vote to promote the creation of local agents for a just ET, and with a category for projects that aim to mitigate the causes and effects of EP (EM3; Coop57, n.d.; Som Energia, 2022).

Some Catalan winning initiatives include improving liveability and EE of social housing for vulnerable and marginalised people (Som Energia, 2018); a divulgation work to raise-awareness of energy precariousness through the creation of a children’s book (Germinador Social, 2021); a theatre performance that tells the story of women suffering from EP, aiming to bring attention to how women are the most affected individuals but also the most resilient and proactive ones when fighting against it (Germinador Social, 2019a); and the creation of a mobile application to look up basic information about EP and read the latest news (Germinador Social, 2019b).

By granting a space for EP-related projects and providing inspiring examples, also from other parts of Spain, this tool is able to raise awareness about EP and mainstream EP alleviation.

### ***Generation kWh***

In this project from Som Energia members made contributions in exchange for energy shares (1 share = 100€), depending on their annual electricity consumption. The money raised is destined to building new RE projects (solar, wind and mini-hydro), from which members are entitled to get a proportional share of the electricity (Som Energia, n.d.-i, 2019; SE-3a).

Som Energia guarantees the loan will be repaid over the course of 25 years, during which the members will get the electricity generated at cost price, thus saving money in their electricity bill. Currently, around Spain there are 4,610 members involved, who have contributed with a total of 4.548.900 €<sup>7</sup>. There are two completed projects of this initiative in Seville and Ávila, and a third one in process in Lleida (Catalonia) (Som Energia, n.d.-i). SE-3a mentioned they are seeing other people doing the same initiative,

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<sup>7</sup> As of May 2022

making them really glad to have inspired other communities, as they think it is a great model to expand and replicate.

### **Collaboration with NGOs**

Besides their own projects and initiatives, some of Som Energia’s Local Groups also collaborate with NGOs. The Maresme Local Group have collaborated in some projects with Cáritas and the Red Cross (SE-2). A remarkable example is one where the Group hired a translator to help migrant vulnerable people with administrative issues, and helped them talk to the energy companies and get the social bonus (SE-2). Unfortunately, with the Covid-19 pandemic, they had to stop this initiative, but it has been proposed again to keep working along the EP line (SE-2).

**Table 4**

*Summary of tools and initiatives of RES cooperatives to tackle energy poverty (own creation)*

<b>Learning</b>	Raise awareness about <b>consumption patterns</b> and teach about <b>energy efficiency</b> to reduce energy <b>expenditure</b> . Share <b>tools</b> for fighting EP and make EP more <b>visible</b> .
<b>Energy Communities</b>	<i>Covadonga</i> - <b>shared PV installation</b> in municipal space; the community covers the costs of those unable to pay their part <i>EC in Lleida</i> - <b>shared PV installation</b> in municipal space where everyone chooses their supply company; vulnerable consumers able to get the <b>social bonus</b> ; <b>discount</b> on electricity bill in exchange for surplus energy <i>Balenyà Sostenible</i> - <b>shared PV installation</b> funded through a banking institution; 10% of produced energy goes to vulnerable households (or municipal spaces if there are not any)
<b>Voluntary Cent</b>	0.01€ <b>donation</b> for every kWh spent that can be destined to <b>EP-related projects</b> . E.g. “Llars del seminari”, a <b>social inclusion project</b> , consisting of a PV installation in a building for people at risk of social exclusion that decreases their annual bills by 30%
<b>Collective Purchases</b>	Through <b>self-production collective purchases</b> , a <b>free installation</b> is given to a non-profit entity or community. E.g. “Marpi Foundation”, a <b>non-profit</b> and socially committed entity working with social and occupational <b>integration</b> of people with intellectual disabilities
<b>Germinador Social</b>	<b>Contest</b> based on popular vote to promote the creation of <b>local agents</b> for a just ET, with a specific category for <b>EP initiatives</b> . E.g. children’s book to raise awareness of energy precariousness, performance to bring attention to women’s struggles and fight around EP, and mobile app to learn about EP.
<b>Generation kWh</b>	Economic contribution in exchange for <b>energy shares</b> of a <b>collective shared RE installation</b> . Members involved get the energy at cost price, thus <b>decreasing</b> their <b>expenditure</b> .
<b>NGO Collaboration</b>	E.g. hiring a <b>translator</b> to help migrant vulnerable people with administrative issues

RES cooperatives contribute to fighting EP in many ways, and there are many hopeful initiatives showing an alternative model that can achieve an ET that protects vulnerable groups, the environment, and gives people agency in managing RE projects in their territories. But with hope also comes despair, as will be seen in the following challenges and limitations.

### ***Challenges and limitations***

SE-2 and SCS think cooperatives should not have the main responsibility in tackling EP. Som Energia has been able to keep the price stable, so their clients have not been affected by the exceptionally high energy prices (SE;SE-3a;SE-3b). Though a remarkable action, this should not be a sole responsibility of cooperatives and a compromise to their survival, but rather a state mechanism to prevent households from being at risk of an EP situation (SE). Som Energia believes that the public administration should firmly act to protect the most vulnerable sectors, and finds there is not enough legislation, tools, or resources for the free-market retailing companies to guarantee the supply to users that are in a vulnerable situation (EM3). Many of the current solutions are more of a patch measure to tackle vulnerability situations than real solutions to end energy poverty (SE).

It is already hard for these entities to enter the Spanish energy market, but once they manage, they find themselves at the mercy of the market mechanisms, experiencing the effects of unconnected state and autonomic policies (SE). Hence, many people choose to form a local EC instead of a retailing cooperative (SCS). SE-2 mentions that the actions of Som Energia and its Local Groups are limited to helping with the set-up of the different EC (e.g. finding actors or talking to the municipality), as the cooperative would not be the direct beneficiary of the EC and the Local Groups lack legal recognition.

Different members of Som Energia stress that despite their willingness to fight EP, they do not have enough economic resources. Though they would like to offer lower energy rates for vulnerable consumers, like the social bonus, they cannot afford it (SE-2; SE). Moreover, they cannot build as much RE infrastructure as they would like, as it is dependent on investment, and the only ones who can afford it are big corporations (SE-2). Despite the intentions of the 2019 Decree for RE promotion, the reality has been that cooperatives have found many difficulties in implementing RE installations (SE).

## 6. Discussion

### 6.1. Cooperative Members and Inclusivity

Regarding the **SQ1**, RES cooperatives are actively working towards inclusivity with the tools they have and with a welcoming attitude for everyone, yet they are experiencing some challenges attracting diverse profiles, especially the most vulnerable ones.

All the interviewed cooperatives clearly say they are open for everyone, and they welcome any new member that wants to join regardless of their reasons. Som Energia particularly makes a big effort in this aspect, always being available for questions, sharing knowledge and free resources, reaching out on social media, being language-inclusive, involving themselves in local communities through the local groups, and trying to be as open and transparent as possible. Balenyà Sostenible, through its EC initiative where members do not need to pay anything else than the initial contribution, shows a different approach that could potentially provide more space and inclusion for marginalised and precarious groups.

The lack of diversity in member's profiles of different cooperatives seems to be linked to the activities and services they offer to their members, but it is also rooted in the deeper problems originating from current social structures and insufficient protection mechanisms.

Having to pay the initial contribution might prevent some people from joining. I discussed with the participants from Som Energia whether it was possible to pay the contribution in instalments or if there was any social fund that could cover this fee. SE-3a did not know if that was a possibility but thought it should be an option, and decided to talk about it with the 'consell rector' in their next meeting. However, SE-1 said that despite being a good idea, not paying the contribution was a delicate matter due to the temporality of EP: *What should they do if someone that did not pay stopped being in a vulnerable situation: make them pay back, ignore it...?* So as of now, to not overcomplicate the situation and treat everyone equally, every member has to contribute with the same amount (SE-1).

The main barrier that cooperatives face when trying to be inclusive is related to class. Currently, many cooperative activities seem to be only accessible for those households with enough resources to spend



on energy services. Moreover, public aids are only useful for people in a privileged position that have already capital to spend. Furthermore, environmental awareness seems to be an important reason to join a cooperative, which in most cases, is related to high level of education, good and stable living situation, and being well integrated within society.

Other barriers might be the language—as information and resources might not be accessible to migrant people that do not speak Spanish or Catalan-, the lack of information about what being a member of a cooperative entails, or simply complete lack of knowledge about cooperatives' existence due to precarious living conditions and limited access to (digital) information. All these factors affect the diversity of profiles and hinder the inclusion of vulnerable social groups. At the end of the day, if someone is not making it to the end of the month and feels excluded from society, either economically, socially, or culturally, joining a RES cooperative will not be their priority, even if they could benefit from it in some way.

## **6.2. Fighting Energy Poverty**

Concerning the **SQ2**, I have found RES cooperatives mainly alleviate EP in two ways: (1) by decreasing people's electricity bill, and thus alleviating an economic burden that directly impacts their well-being, and (2) by mainstreaming the issue of EP and bringing attention to it, with the hope of getting the public administration to destine more resources to tackle the problem.

I have seen many innovative ways in which RES cooperatives, especially Som Energia, work to reduce the energy expenditure, showing that positive initiatives from social entrepreneurs like them are actually taking place right now. Shared self-consumption has been discussed as a powerful and flexible tool to give people agency and tackle vulnerability, as it contemplates the possibility of a household being in a vulnerability situation for a specific time period, and it provides space for collective solutions and cooperation among members of the community.

Through their direct engagement and their close and transparent relationship with their members or clients, cooperatives seem more likely to detect cases of HEP and act upon them. Yet, this might represent a great effort in terms of economic or human resources.

Some members from Som Energia, and likely from other cooperatives, do not want to give up their environmental beliefs and commitment to a fair entity, yet they cannot afford their electricity contract (SE). Then either they allocate their few resources to pay for energy services, thus not having enough money to eat or cover other necessities, or they restrict their energy consumption to be able to pay the bill (SE). Even if the cooperative tries to convince them to change companies and get the social bonus, they refuse because they do not want to support such opaque and speculative entities that do not provide a 100% RE mix (SE). This situation, that should be handled through state budgets and taxes, is actually supported by RES cooperatives and their members (SE).

By paying attention to the problems cooperatives face and being aware of their lack of resources, the public administration would be able to better identify the gaps where vulnerability sneaks into and come up with practical solutions to end EP. A bottom-up knowledge transfer approach would be an easy and respectful way of recognising the improvement points while listening to vulnerable people's experiences. The municipalities could benefit a lot from having thorough conversations with the RES cooperatives present in their territory, where lessons learned could be shared, and a way forward collectively decided to enhance the inclusion of vulnerable groups, local engagement, and environmental management and protection.

When examined through the vulnerability lens, RES cooperatives are positively contributing to the three factors that influence vulnerability, ultimately improving the resilience of their members (and other households). First, they actively work to decrease energy expenditure (thus, influencing the ratio between energy prices and household income) by means of learning and innovative tools such as the Generation kWh or the voluntary cent. They also pay great attention to EE, and many of them actively work in this front by providing efficiency studies or teaching through workshops. By sharing knowledge and tools about decreasing energy consumption, they have a positive impact on households' needs. Lastly, by providing inspiring examples such as shared self-consumption initiatives, cooperatives show that an alternative approach to the current energy model is possible. One where people can have agency over their energy sources, and be more flexible and resilient in the face of change by not being dependent on the energy market's fluctuations.

Still, there are many limitations that cooperatives experience when working in this front and many challenges to overcome. As SE remarks, RES cooperatives, and especially Som Energia, as a producing

and retailing cooperative, would be able to help in EP situations if (1) the prices of energy would decouple, so they could offer the real cost price of RE to their clients and thus include people in precarious situations, or (2) further promote self-consumption to escape the workings of the present Spanish energy market. But unless things change in the energy sector, the second option is the most viable one to ensure access to affordable energy for all (SE). Furthermore, if more resources were invested in EE and improving dwellings' insulation, thus decreasing energy consumption, more pressure would be lifted off of cooperatives' shoulders when trying to offer lower fares. Lastly, better connecting the Spanish and Catalan laws to have a common definition of vulnerability would likely protect more the vulnerable consumer.

### **6.3. The Desired Energy Model**

The latest events and instabilities happening in the national and European level show the need to shift away from a model where the oligopoly keeps making huge amounts of profit into one where energy is a decentralized and common good, the territory is sovereign, and energy poverty is not a reality any more (BS; SE; Comas, 2022; Riba, 2021). As SE says,

*“No one should profit selling energy”*

This alternative energy model considers (renewable) energy an essential and public good, and therefore, it should be regulated, not tied to offer and demand (SE). Providing RE at cost price, not at fossil price, would help improve the living situation of many households (SE). Additionally, self-production needs to be promoted and enabled, and RE should be produced as locally as possible, and in a smaller scale. Not only the sources of energy need to change, but also the behaviour around our energy consumption, aiming at a significant reduction (SE-2; Riba, 2021).

SE-1 believes that RES cooperatives that are aligned with the values of the social and solidary economy will have a key role in the ET, as they are adapting quite well to change and give a lot of hope and trust in the midst of an opaque energy sector. This new model has at its core very different values than the current one, as many cooperatives express on their websites: Azimut360 “fights to decentralise energy generation and empower people through self-sufficiency [...] a space of social co-responsibility, personal empowerment and collective transformation” (Azimut360, n.d.) and Pinergia aims to “work through a

decentralised, horizontal and environmentally-respectful energy model, collaborating with local producers from the territory” (Pinergia, n.d.-b). Put in the words from Pérez-Suárez et al. (2021): “these cooperatives are socializing renewable energy”, a behaviour that radically differs from that of the current energy sector.

The renewable model will inevitably transform the territory, yet if this is done through direct participation of local communities, it will bring acceptance, agency, and sovereignty (Comas, 2022). As seen from the different projects and types of initiatives RES cooperatives do, we notice that the new energy model can include diverse approaches and local initiatives for each territory or situation. Cooperatives acknowledge that there is not a one-size fits all approach and that each context should be carefully considered. They advocate for learning and communicating with civil society, municipalities and other administrations, while building transparent relationships of trust and respect, a radically different behaviour than the one from the current energy oligopoly.

Finally, as SE notes, the main thing required to change the model is political will. Currently, without a state intervention, EP will be forever perpetuated. Even if initiatives like RES cooperatives are making a big effort to improve the situation and civil society is becoming aware of the problem and demanding action, no favourable change will happen unless the right policies and measures are put in place (SE).

#### **6.4. Actors in the Energy Transition**

Regarding the main RQ: *Can RES cooperatives contribute to a fair and inclusive decarbonisation of the energy sector in Catalonia?*, I have found that yes, they can contribute positively to the decarbonisation. RES cooperatives by existing and working in a caring and respectful way towards people and the environment, being aligned with the values of the social and solidary economy, are opposing the exploitative behaviour of the current energy oligopoly (SE-1; SE-3b). They are intrinsically powerful for a decarbonisation of the Catalan energy sector, as they commit to only produce and supply RE and to reduce energy consumption, which is key to ensuring a sustainable future (Comas, 2022). As non-profit organisations that are socialising RE, they are trying their best to provide access to clean and affordable energy for everyone, becoming entities very much aligned with SDG 7 and thus making greater steps towards a sustainable transition (Pérez-Suárez et al., 2021; United Nations, n.d.).

Som Energia is the best example of how a RES cooperative can grow and expand, being the biggest and oldest one in Catalonia. The most effective ways are word-of-mouth and local engagement through the Local Groups, but also outreach through online platforms. More similar initiatives keep appearing and spreading thanks to inspiring ones like Som Energia or Balenyà Sostenible, that give example of alternative models of production, consumption and behaviour, and of walking the ET path in a way that accounts for fairness, equity, and inclusivity.

*“Remaining in the old paradigm leads to failure. [...] one of the most exciting aspects of the energy transition is its transforming potential of the social sphere. Thus, it is needed to modify the social perceptions around energy, as a first step to change to a new paradigm [...]”* (Riba Romeva et al., 2021).

The energy oligopoly, by greatly profiting of providing energy services, especially in times of crisis, exacerbate the vulnerability situation of many households, as capital and resources remain in the hands of a few (SCS; SE; SE-3b). Large energy companies are not promoting a decrease in consumption or empowering civil society in learning about energy, nor are they protecting the environment and working towards a sustainable transition (SE; SCS; SE-3a). Remaining stagnant in this behaviour will further perpetuate the already existing EP and inequality in Catalonia, only decarbonising the energy sector without bringing about the necessary changes to achieve a fair and inclusive ET.

However, RES cooperatives through acting from the values of cooperation, transparency, and equality, among others, and by treating energy as a common good to which everyone is entitled to, thus democratising the energy sector, are working to create change in the social structures, bringing about the decentralisation of resources and capital. By enabling access to energy services, they enhance social inclusion (European Parliament, 2019). They are some of the actors that take most seriously the “no person and no place left behind”, making great effort to create space for everyone and fight EP through many initiatives and tools. This behaviour of inclusion and fairness is very much aligned with the social and sustainability targets demanded by the EU.

## 6.5. Final Remarks and Future Research

As mentioned previously, EP theory is still quite new and limited, and the vulnerability lens quite general. Despite these limitations, they have been useful notions to guide this thesis, and have allowed me to identify what all the cooperatives' tools and initiatives have in common in order to improve the living situation of many households. The vulnerability lens has also proved effective in recognising the ways in which cooperatives actively work to fight EP. It would be interesting to do more research on EP and vulnerability in Catalonia, with emphasis on the spatial distribution of it, and link it to the density of self-consumption initiatives and engagement in RES cooperatives. A quantitative approach on the Catalan context would also be beneficial to enrich existing knowledge on EP.

Further research could also explore the different options and conceptualisations that the future Catalan (and Spanish) energy model can have, as well as the role that RES cooperatives will take in it. It would also be very enlightening for the Spanish ET to study the situation of the different autonomous communities in regard to RE implementation, successes and shortcomings of RES cooperatives, and status of EP, to identify the key common issues and spaces for potential improvement to achieve a just energy transition and meet the set environmental and social targets.

## 7. Conclusion

In this thesis, I aimed to explore the role of RES cooperatives in the context of the Catalan ET. Through investigating the inclusivity of the cooperatives and the ways they contribute to fighting EP, I aimed to answer whether RES cooperatives can contribute to a fair and inclusive decarbonisation of the energy sector in Catalonia.

Framed by EP theory and analysed through the vulnerability lens, I found that cooperatives are actively working towards inclusivity with a transparent and welcoming attitude through tools such as knowledge sharing and outreach, local involvement, and language-inclusivity. However, there is still a lack of diversity in member's profiles that seems to be linked to the type of activities and services offered to members, where often these are only feasible to households with enough capital to spend. Furthermore, the inclusion of precarious social groups is hindered by insufficient protection mechanisms from the public administration, such as the inability of cooperatives to offer lower energy prices to vulnerable consumers like the social bonus.

Regarding EP, I found that RES cooperatives mainly alleviate EP by (1) decreasing people's electricity bill, and thus alleviating an economic burden that directly impacts their well-being, and by (2) mainstreaming the issue of EP and bringing attention to it, with the hope of getting the public administration to destine more resources to tackle the problem. When analysed through the vulnerability lens, RES cooperatives are positively contributing to the three factors that influence vulnerability—namely, decreasing expenditure and thus the ratio between energy prices and income, improving EE, and decreasing energy consumption and thus households' needs —, ultimately improving social resilience and alleviating EP. However, many limitations and challenges are still present. Further, having a common definition of vulnerability in the Catalan and Spanish law, thus better connecting state and autonomic law, would help protect vulnerable households better.

Lastly, RES cooperatives work in a transparent and caring way, follow the cooperative principles and are aligned with the values of the social and solidary economy. This behaviour, together with their efforts in socialising RE and fighting EP, make cooperatives powerful actors in a decarbonisation of the energy sector that accounts for fairness and inclusivity, providing inspiring examples of what an alternative energy model could look like in Catalonia.

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## 9. Appendices

### 9.1. Appendix A: Energy Sector and Energy Poverty

**Table A1.**

*Evolution of the primary indicators of energy poverty in Spain 2017-2020*

Primary indicator	2017	2018	2019	2020
Disproportionate expense 2M (% households)	17.3	16.9	16.7	<b>16.8</b>
Hidden energy poverty HEP (% households)	10.7	11.0	10.6	<b>10.3</b>
Inadequate temperature in the household in winter (% population)	8.0	9.1	7.6	<b>10.9</b>
Arrear on utility bills (% population)	7.4	7.2	6.6	<b>9.6</b>

*Note.* This table presents the values of the four primary indicators of energy poverty from 2017 to 2020. The last two indicators are significantly higher for 2020, while the second one remains quite stable and the first one has slightly decreased. As this data stops in 2020, it does not show the evolution of the indicators after the COVID-19 pandemic and the war in Ukraine (Miteco, 2021). Adapted by author.

**Table A2.**

*Targets of the energy poverty indicators for 2025*

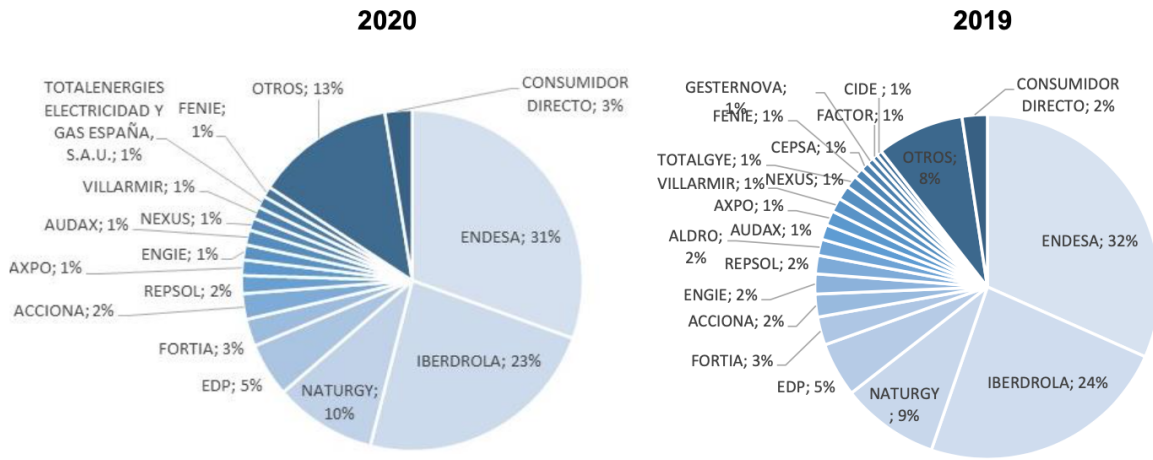
Primary indicator	2017	Minimum target for 2025	Actual target for 2025
Disproportionate expense 2M (% households)	17.3	12.9	8.6
Hidden energy poverty HEP (% households)	10.7	8.6	5.7
Inadequate temperature in the household in winter (% population)	8.0	6.0	4.0
Arrear on utility bills (% population)	7.4	5.5	3.7

*Note.* Adapted by author from the *Updated Indicators of the Strategy against Energy Poverty* of the Spanish Ministry for the Ecological Transition (Miteco, 2021).



**Figure A1.**

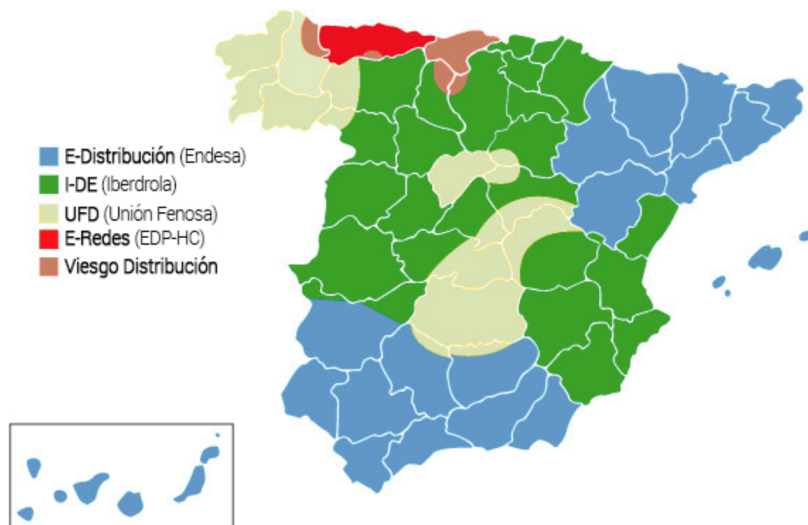
*Energy supply share of the retailing companies of the Spanish electricity market*



*Note.* This figure shows the structure of the retailing sector of the electricity market. Endesa and Iberdrola represent more than half of the total energy supply, and 72% of the retailing is in the hands of just five companies (CNMC, 2022).

**Figure A2.**

*Spatial distribution of energy distribution companies*



*Note.* This figure shows the five distribution companies that spread throughout the Spanish territory (Som Energia, n.d.-j).

## 9.2. Appendix B: Data Analysis

**Table B1.**

*Overview of the cooperatives' members interviewed and the used identifiers (own creation)*

<b>Cooperative</b>	<b>Representative</b>	<b>Identifier</b>
Balenyà Sostenible	Member of the cooperative	BS
Som Energia	Member of the cooperative and part of the legal team	SE
Som Energia - Grup Local 1	Member of the cooperative and of a Local Group	SE-1
Som Energia - Grup Local 2	Member of the cooperative and of a Local Group	SE-2
Som Energia - Grup Local 3	Member of the cooperative, of a Local Group, and part of the <i>Consell Rector</i> (governing board)	SE-3a
	Member of the cooperative and of a Local Group	SE-3b
Som Confort Solar	Member of the cooperative	SCS

**Table B2.**

*Overview of the extra empirical material obtained through the interviewees of Som Energia (own creation)*

<b>Material</b>	<b>Identifier</b>
Survey 'Why did you join?'	EM1
Survey 'How did you get to know us?'	EM2
Slides on energy poverty	EM3
Slides on energy communities	EM4

**Table B3.***Coding for analysis. Translated from Catalan (own creation)*

<b>Energy Poverty</b>	General	PE
	Administration, funding & bureaucracy	PE-AFB
	Affected communities	PE-COM
	Cooperatives & initiatives	PE-COOP
<b>Cooperatives</b>	General	COOP
	Members	COOP-M
	Inclusivity	COOP-I
	Expansion & growing	COOP-EC
	Initiatives & challenges	COOP-IR
<b>Energy Sector</b>	General	SE
	Local opposition	SE-OT
	Fighting the oligopoly	SE-OL
	Energy model & energy transition	SE-METE

### 9.3. Appendix C: Interview Guide

(Translated from Catalan)

Good morning/afternoon! First of all, thank you very much for taking the time to have a conversation with me, I really appreciate it.

I would like to take this opportunity to introduce myself and my research study. Please, don't hesitate to ask any questions and share any comments you may have.

[introduce yourself and explain what this thesis is about]

Now I would like to ask you for permission to record this interview, so that I am able to be fully attentive in our conversation and not miss important details: You agree that you have been informed about the topic of study and you agree to participate in it. The interview will be completely anonymous and I will only mention to which cooperative you belong to. The participation is voluntary, so you are free to withdraw at any time, including the information you shared. This thesis only has academic purposes, so you will be able to find the published thesis at the Lund University library.

#### Guiding questions:

1. First, I would like to know how did you become a member of the cooperative. How did you discover its existence?
2. Which steps did you take to become a member? Did you need to pay an initial fee?
  - a. Do you know if there is any possibility of paying such fee in installments or get any help to pay it?
3. Before joining the cooperative, did you have any difficulty in paying the energy bill? Do you think this is the case for most members?
4. Do you feel that now you save more money in your household's energy bills?
5. Do you have any initiatives to fight against energy poverty in Catalonia (like the Cañada Solar one in Madrid from Som Energia)? Or do you have any collaboration with social services or entities like migrant people associations?

6. How do you think the cooperative could reach out to more people in a situation of energy poverty and get on board more vulnerable people?
  - a. Is it an information-, resources-, or legislative-wise problem?
7. Do you consider that when the cooperative was created, inclusivity, gender equality, and diversity were a top priority?
  - a. Do you know what's the percentage of women in responsibility positions?
8. Do you think that including more diverse profiles into the cooperative would help in regard to territorial expansion and growth?
9. Did you notice if in different areas with great local opposition to new RE installations, the cooperative has managed to involve the community through a more participatory approach and end the initial opposition?
10. Finally, what do you think is the role of RES cooperatives in the Catalan energy transition?

Thank you very much for participating in this study. Your participation has been very valuable and it has allowed me to know more about the topic. If you have any further questions, don't hesitate to contact me. Have a nice day!