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Energy Communities as a Tool to Finance Local Community Development

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1. Introduction

1.1 Introduction to the topic

Energy communities represent a vital tool for the green transition; they promote the diffusion of clean energy while at the same time putting citizens at the forefront (Lowitzsch et al., 2020). Furthermore, given the direct involvement of citizens and local actors, they contribute to increasing the acceptance of renewable energy projects while at the same time mobilizing private investments in the field of renewable energy. Furthermore, they provide direct benefits to the citizens by promoting energy efficiency and lowering the price of energy bills.

Member states have implemented several support schemes to support energy communities across Europe, such as tax breaks, subsidies, tax incentives, social tariffs, and feed-in tariffs (Lode et al., 2022). For these reasons, energy communities can be seen as an exciting business opportunity (Ibid). This is particularly true in Italy, where an advantageous incentive scheme has been implemented.

On the one hand, energy communities represent a profitable business opportunity; on the other hand, by law, their primary purpose is to deliver environmental, economic, and social benefits for their members and community. Even though they can generate profits and their primary objective is to provide a positive impact on the local community, there is sometimes a loss of social value. This is especially true if we consider energy communities of which SMEs are members. In this situation, who indeed profits is the plant owner, who on average shares only 10% of the revenues generated with its members. These economic benefits, of course, represent a discount on the energy bill, thus causing a positive impact for the members. However, at the same time, the profits of the plant owner are usually not reinvested. Even if this is the case, there is limited impact.

For this reason, the thesis is dedicated to analyzing the feasibility of giving birth to a legal entity that can collect capital from existing energy communities to finance new energy communities. On the one hand, such a project can contribute to the promotion of energy communities; on the other, it can increase revenues of existing energy communities, increasing the economic benefits shared among their members.

1.2 Aim and Research Questions

This research aims to determine the feasibility of creating a legal entity that collects capital generated from the revenues of existing energy communities to finance new ones. This results in the following research question for this thesis.

- *Is it feasible to create a legal entity that collects capital generated from the revenues of existing energy communities to finance new ones while at the same time protecting the interests of existing members?*

To answer the previous question, the following sub-questions must be addressed

- *Are Energy Communities capable of generating enough revenues?*

Providing an answer to this question is fundamental since the project explicitly targets energy communities as a source of capital.

- *Will there be enough energy communities in the forthcoming years?*

Another fundamental aspect that must be considered is the expansion of energy communities. For the project to be sustainable from an economic point of view, it is necessary to thoroughly assess whether the forecasted expansion of energy communities is adequate.

- *Is the business model sustainable?*

- *Which and why would be the most suitable legal entity for the organization?*

1.3 Scientific and Social Relevance

The research is scientifically relevant because it contributes to the existing literature in the following ways. First, energy Communities are still relatively young entities, and second, not all the member states have implemented the necessary directives to enable energy communities. Research has mainly focused on four areas (Lode et al., 2022). The first one is related to the motivations to set up and join an energy community, an example of this could be Bauwens' research on the heterogeneity of the motivations to join energy communities that has shown that both economic incentives (lower energy costs) and normative motivations (fighting climate change) were the most important. The second one deals with the social acceptance of ECs and the technological assets installed in the ECs. Wolsink distinguishes between EC adoption on a sociopolitical, community, and market level. The author emphasizes how RES-generated electricity is becoming a common good, fostering acceptance through co-ownership. The third, instead, focuses on the actors necessary to start up ECs. Flei et al. looked at which actors are most inclined to join ECs and found that those who profit financially are more likely to do so. In contrast, the last cluster focuses on dedicated collaboration on the transition between actors, sectors, and systems (Ibid). This last cluster was defined by Lode et al. as action research (Ibid). According to Clark and Dickson, this field of research aims at promoting a transition toward more sustainable practices while at the same time involving different stakeholders belonging to different sectors. Despite these attempts, there are still some research gaps that must be filled. In particular, Gjorgievski et al. have identified four main aspects on which there is still much work to do.

In the first place, further research should be done to analyze the most efficient ways to avoid drop-outs among the members of energy communities (Gjorgievski et al., 2021). In the second place, current literature has made it clear that there are several benefits for the members of energy communities, but if we take a broader look, there is the risk of imposing costs on other actors such as DSOs (Ibid). Further research must be done on this topic to ensure that the diffusion of energy communities can generate added value for all the actors involved. In the third place, there is a need for a common framework for trade-off analysis. There are several indicators to measure the positive social impacts of energy communities, but there is still much work to be done. “Social impact indicators can be used alongside economic, environmental and technical indicators to develop a common framework for multi-dimensional trade-off analysis of energy community impacts that will be valuable for community members, policymakers and investors” (Ibid). Lastly, further research is necessary to analyze the evolution of investment opportunities and interests over time. Most studies consider the procurement of energy infrastructure as a single-stage event (Ibid). “However, experience shows that it is more common for energy communities to spread out their investments over time, based on annual savings, the development of local financial opportunities, and the interests of the community” (Ibid). Usually, these temporal dynamics are not taken into account.

Drawing upon the research gaps highlighted by Gjorgievski et al., this thesis tries to address the last aspect, focusing on the financial opportunities that energy communities can create, in the long run, for both members and society in a broader sense.

Aside from its scientific relevance, this research also has high social relevance. Energy Communities can drastically change the logic of energy distribution. We are assisting a shift from a centralized and hierarchical distribution system to a more decentralized and democratic one (Klagge & Meister, 2018). Energy communities challenge the mainstream capitalistic approach because they put people’s environmental, social, and economic benefits at the forefront in the commercialization phase (Ibid).

Energy communities promote the shift towards a ‘distributed energy system’, meaning an energy system in which energy conversion units are located close to energy consumers (Alanne & Saari, 2006). “In addition to the distribution of technology, a distributed energy system means the reallocation of decision-making, expertise, ownership, and responsibility in terms of energy supply” (Ibid). Distributed energy systems benefit the people by making their energy supply more efficient, reliable, and environmentally friendly (Ibid). According to Alanne & Saari distributed energy systems represent a fundamental tool for promoting sustainable development, making the energy system thanks more flexible, local, and connected (Ibid). Flexibility is associated with scalability, meaning that these kinds of systems can rely on multiple energy conversion technologies and fuels (Ibid). Within distributed energy systems, the reliability of energy supply is improved because of their tendency not to “put all the eggs in one basket” (Ibid). Distributed energy systems also contribute to sustainable development because of the absence of large power plants and transmission lines (Ibid). Also, considering local decision-making and expertise, the ‘educative’ effect of distributed energy generation should not be underestimated (Ibid). In a broader sense, we are assisting the shift from electricity conceived as a private commodity to electricity as a common good co-produced by different actors (Wolsink, 2020). In this way, energy is no longer purchased by consumers but is co-produced. For these reasons, the promotion of energy communities and distributed energy systems, in general, must be promoted.

More specifically, energy communities represent a viable solution to generate positive societal impacts. Energy communities affect the local economy and energy system, the energy transition's social acceptance, and energy-related behaviors (European University Institute. Robert Schuman Centre for Advanced Studies., 2020).

Energy community projects are often related to increasing local jobs and economic development (Ibid). Traditional incumbents are more likely to rely on internal know-how to develop renewable energy projects (Ibid). Instead, community-based energy projects rely on local suppliers and technicians to compensate for the internal lack of skills (Ibid). Local benefits of these projects can be seen in the return of investments for members, job creation, and redistribution of revenues (Ibid). This is especially true for energy communities, which according to the European legal framework, are obliged to consider the economic, environmental, and social benefit for the community over financial profit. This aspect will be discussed later on. The development of energy communities also affects the energy system as such. Community-based energy projects push towards a more decentralized energy system (McKenna, 2018). As we have previously seen, this can lead to a more secure energy supply that gradually relies less on the central grid. This phenomenon might switch costs on other actors, but this aspect is not the main focus of the thesis. It is worth mentioning that given all the benefits of energy communities and distributed energy systems present, policymakers should focus on the issue, and assure a just a transition.

Furthermore, several studies have shown a positive correlation between community-based renewable energy projects and increased social acceptance of renewable energy sources (European University Institute. Robert Schuman Centre for Advanced Studies., 2020).

Lastly, some studies have shown that participation in community-based renewable energy projects is positively correlated with more energy-efficient behaviors (Ibid). Furthermore, according to Berka and Creamer (2018), there is considerable evidence that active participation in community-based renewable energy projects leads to acquiring knowledge and skills across different sectors, such as energy technologies, project management, communication, business development, finance, and law.

It is also worth mentioning that the Italian National Recovery and Resiliency Plan has allocated many resources to foster the growth of energy communities in Italy. The aforementioned plan foresees 2,2 billion euros for energy communities and collective self-consumption. This shows the strategic importance of energy communities.

With this being said, it is helpful to recall what Berka and Creamer (2018) have argued. More specifically, the positive societal impacts generated by energy communities vary across case studies and cannot always be taken for granted (Berka & Creamer, 2018). As stated above, especially in the context of SMEs, energy communities are seen more as a source of profit rather than an opportunity to generate a genuine impact on the territory. For this reason, the project proposed within this thesis is relevant from a societal point of view.

1.4 Methodology

The information provided in this thesis will be mainly obtained through desk research, sensitivity analysis, and Interviews. When explaining energy communities, reference will be made to multi-disciplinary literature deriving from different fields. As we will see later on, the diffusion of energy communities impacts various areas, technological, social, economic, environmental, and political (Gui & MacGill, 2018). Hence, a multi-disciplinary approach is necessary. Instead, references to legal aspects will stem from doctrinal research and scientific literature from the legal field and primary sources. Connection to primary resources is fundamental when discussing energy communities, especially in Italy, where all the regulations on the issue explicitly reference definitions provided by EU legislation. Instead, reference to doctrinal research and scientific literature from the legal field is necessary to provide adequate information on the measures adopted to promote renewable energy sources and the promotion of energy communities. Especially in Italy, as we will see, these kinds of policies have not followed an autonomous path but instead have responded to external commitments, resulting in a fragmented approach. Therefore, it is essential to rely on the legal field's doctrinal research and scientific literature to reconstruct the primary measures. To describe the projects' feasibility, sensitivity analyses, interviews, and desk research will be carried out. Desk research and interviews will be done to justify and verify assumptions. Once the assumptions have been verified and justified, sensitivity analysis will be carried out. Thanks to this kind of analysis, it is possible to verify and quantify the impact of a variable, which is considered independent, on a dependent variable given a set of assumptions (Christopher Frey & Patil, 2002). This kind of analysis is helpful because it can quantify the impact of those factors that can be considered a threat to the project. Reference to doctrinal research and scientific literature from the legal field will be made to verify the most suitable legal entity for the organization.

1.5 Reading Guide

The thesis will be structured in the following way. Section two defines energy communities and how these entities operate. Instead, section three will provide an overview of the EU's and Italy's central policies to promote the use of renewable energy sources. This section must provide the reader with the necessary concepts that will be operationalized. Section four will describe current trends in the energy communities' sector, focusing on the technological setup, promoter(s), nature of the players involved, value proposition, financing methods, and mechanisms for distributing economic benefits among members. Section five is dedicated to analyzing the business plan of a renewable energy community. The scope of this analysis is to understand and estimate the potential revenues and costs of an energy community. Once this analysis has been conducted, trends within the energy community market will be analyzed to estimate the expansion of energy communities. This is the main focus of section six. Section seven is dedicated to drafting a business model for a legal entity that collects revenues of existing RECs to finance the birth of new ones. Section eight will describe the selected legal nature of the entity and the influence it has on the business model. Section nine analyses the entity’s business plan. Section ten, instead, will measure the positive impacts this initiative can generate. Section eleven will try to quantify the risks that may be encountered when developing such a project. Section twelve, instead, will provide brief conclusions commenting on the feasibility of the project and will give suggestions for future research.

2. Energy Communities: Providing a Definition

Even though much has been written on energy communities providing a clear and comprehensive definition of energy communities is not a simple task (Bauwens et al., 2022). In order to provide an adequate definition of energy communities, it is crucial to refer to other concepts. In particular, the concept of community energy. Community energy can be defined as the rising tendency of citizens to demand a more decentralized and democratic energy system (Schoor et al., 2016). In literature, when discussing renewable energy sources, citizens are often considered passively, either willing to accept renewable energy sources or refuse their use (Sardianou & Genoudi, 2013). More specifically, current literature mainly focuses on investigating whether citizens are willing to participate in public energy efficiency programs, install new technological assets in their households, or accept renewable energy sources when they are given the opportunity (Zoellner et al., 2008). Citizens can influence public interventions in the energy sectors through acceptance, acquiescence, or resistance to changes in the energy system (Stern, 2014). Resistance to clean energy has been analyzed for a long time, where concepts such as the NIMBY (not in my backyard) phenomenon (Jolivet & Heiskanen, 2010) and procedural justice (Schweizer-Ries, 2008) are discussed.

Despite this, some studies argue that citizens have more extended roles in the energy system (Walker, 2008). Walker and Cass, already in 2007, individuated ten roles consumers have within the energy system, and the traditional passive consumers are just one of the roles customers can choose. The roles individuated range from a captive consumer to a consumer who has become an energy producer (Walker & Cass, 2007). The former limits himself to paying the energy bills to established energy suppliers. In this case, the consumer is at the “*end of the wire*” (Ibid), meaning that he is distant from the source of renewable energy, which is dispersed through the national grid. The captive consumer is unaware that part of the energy he consumes derives from renewable sources (Ibid). When the customer himself becomes the producer, he directly owns the generation technologies (Ibid). Of course, the proximity to the generation technologies is high, and the consumer is aware and active (Ibid). The following table shows the ten roles individuated by Walker and Class.

Roles	Description	Proximity to technology	Level of awareness/active engagement with renewable energy
Captive consumers	Pay bills to established energy supplier.	End of wire. Distanced from the sources of renewable energy dispersed through national grid.	All energy customers (unknowingly) consume some energy from renewable sources.
Active customers	Actively choose between suppliers including green tariffs which partially or entirely involve renewable generation.	End of wire. Distanced from the sources of renewable energy dispersed through national grid.	Green tariff customers actively choose renewable energy supply.
Service users	Use the services (light, heat, motion etc.) provided by energy generated using renewable technologies, potentially in many different everyday settings and forms and function of building.	May not be spatially close to technologies, but are explicitly so in heat networks and household/community modes of implementation.	The derivation of the energy services may be totally unknown to the user – or visibly, actively and deliberately promoted as being from renewable sources (e.g. in demonstration projects).
Financial investors	Invest in shareholding or interest earning arrangements relating to specific projects, to the broad financing of renewable energy projects or to the investment choices of particular companies.	Investment opportunities may be locally restricted (e.g. REIC-backed projects in Wales[a]); open to distant investors (e.g. JUICE Greenpeace-NPower tariffs for North Hoyle[b]); or aspatial.	Investment in renewable energy whether personally, locally or through companies' portfolios is generally, but not exclusively, active and aware.
Local beneficiaries	Receive benefits in addition to energy services; financial, infrastructural, educational, technological or intangible. Such benefits are increasingly negotiated in formal (planning) engagement.	Benefits may be direct or explicitly tied spatially through community funds administered by local groups.	Such benefits may be visible and known to local people, or hidden and unknown.
Project protestors	Actively object to projects through for example organisation of a local protest group, attending meetings, writing to press, lobbying, signing petitions etc.	While some campaign groups (e.g. Country Guardian[c]) are not spatially linked, most protestors are focused on local projects.	Protest activity is by definition aware and actively engaged.
Project supporters	Actively engage in similar actions to protestors, although support is typically less visibly organised and vocal.	Linked to local projects, tend to overlap with participants. Campaign groups may be spatially distant (e.g. Yes2Wind[d]).	Supporter activity is by definition aware and actively engaged.
Project participants	Get involved in community mode of implementation, includes: membership of organising groups; attending meetings; or hands-on installation or maintenance.	Explicitly linked to spatially-tied community or household modes.	Theoretically any member of a community, in practice involvement is variable and participation can take different forms.
Technology hosts	Owners of buildings or land, but not the renewable energy technology itself.	Necessarily spatially linked.	Intentionally through institutional arrangements (e.g. Windcrofting™)[e] and 'Company Driven' micro-gen; but potentially less so (e.g. new owner of a 'hosting' house).
Energy producers	Directly owns and operates generation technologies.	Normally proximate and part of household.	Necessarily active and aware, although may be acquired with house purchase rather than actively installed.

Figure 1 Source: Walker, G., & Cass, N. (2007). Carbon reduction, 'the public' and renewable energy: Engaging with socio-technical configurations. Area, 39(4), 458–469. https://doi.org/10.1111/j.1475-4762.2007.00772.x

Within the energy sector, the figure of the prosumers is gaining a significant role. With "prosumer," we must intend an actor producing the energy he will then consume. In most cases, these figures share a pro-environmental attitude (Lavrijssen, 2014). The use of small-scale photovoltaic panels, small biomass installations, heat pumps, and solar thermal installations are adequate technologies that make individual prosumers more independent from the central supply grid. However, existing energy companies are trying to hinder the phenomenon by lobbying for policies that protect their interests (Kungl, 2015). Kungl's analysis shows that four leading German energy companies engage in activities that prevent prosumers from being more independent from the central grid. Hirschmöller et al. show that Germany's four biggest utility companies spend several resources to lobby for their interests, hence, trying to maintain the status quo (Sühlsen & Hisschemöller, 2014). Finally, Geels shows how fossil fuel companies are trying to resist these changes. Lobbying by these actors should be further researched and should be put the attention of policymakers because decentralized energy systems represent a tool to alleviate energy poverty (Hanke & Lowitzsch, 2020). Resistance to this change might result in the imposition of costs on vulnerable categories.

Nevertheless, individuals can also have a role beyond the one of individual prosumership; they can participate in community energy initiatives (Schoor et al., 2016). These initiatives show that citizens have started to contribute to the production and distribution of energy (Ibid). For example, in Germany, already in 2012, there were 700 registered energy cooperatives (Holstenkamp & Mueller, 2013). These cooperatives are embedded in local communities and are engaged in trading renewable energies. Several examples of these initiatives can also be found in the UK (Schoor et al., 2016). Sagebiel et al., who carried out an online Choice Experiment in Germany, have shown that transparency, the share of renewable energy, and democratic control are critical issues for those consumers who show a high willingness to pay for renewable energy. Since 2010 many initiatives, like the ones in Germany and UK, have also been borne in the Netherlands (Schoor et al., 2016). Schoor et al. (2016) have studied several of these experiences across the Netherlands. They have shown that the main objectives of community energy initiatives are essentially three. In the first place, pursue sustainability, meaning that the profits generated with the production and distribution of energy will be reinvested in renewable energy projects at the local level (Ibid). In the second place, foster the growth of regional economies (Ibid). The value generated is kept in the region where these projects belong, and the aim is to stimulate innovation constantly on a regional level (Ibid). Lastly, promote more democratic governance of the energy system (Ibid). The governance of energy and the financial resources generated when engaging with the energy sector are managed democratically (Ibid).

As was previously mentioned providing a clear and concise definition of energy communities is not a simple task. However, considering what has been argued above, *energy communities* can be defined as the result of a transition process from a centralized energy system to a democratic and decentralized one. Where energy is no longer seen as a private commodity delivered through the public grid but as a co-owned (Iaione, 2015), co-managed (Foster & Iaione, 2016), and co-produced common good (Wolsink, 2020). A system that goes beyond the individual prosumership but considers active citizens willing to take part in the energy system while at the same time generating a positive impact for their communities. For this reason, energy communities are also seen as a powerful means to achieve a more just and inclusive energy transition while at the same time giving citizens a central role (Hanke et al., 2021). Furthermore, energy communities represent a powerful tool to mitigate energy poverty (Hanke & Lowitzsch, 2020). The inclusion of vulnerable consumers is essential to assure a just transition (Ibid). With the adequate “enabling framework” energy communities may be able to provide cheaper energy prices as well as additional revenues in the form of dividends to their most disadvantaged members. Prosumership is also associated with higher energy efficiency, hence lowering individual energy consumption (Ibid). High energy costs and low income are two key factors contributing to energy poverty and can be addressed through energy communities. Furthermore, participation alleviates social isolation, which many energy-poor households are said to experience (Ibid).

To summarize, we can say that energy communities are entities that aim to promote the use of renewable sources on a local level, foster innovation, and growth of regional economies, and involve citizens in the management of resources. The following table elaborated by Lode et al. (2022) can help us better understand which kinds of initiatives can be considered energy communities.

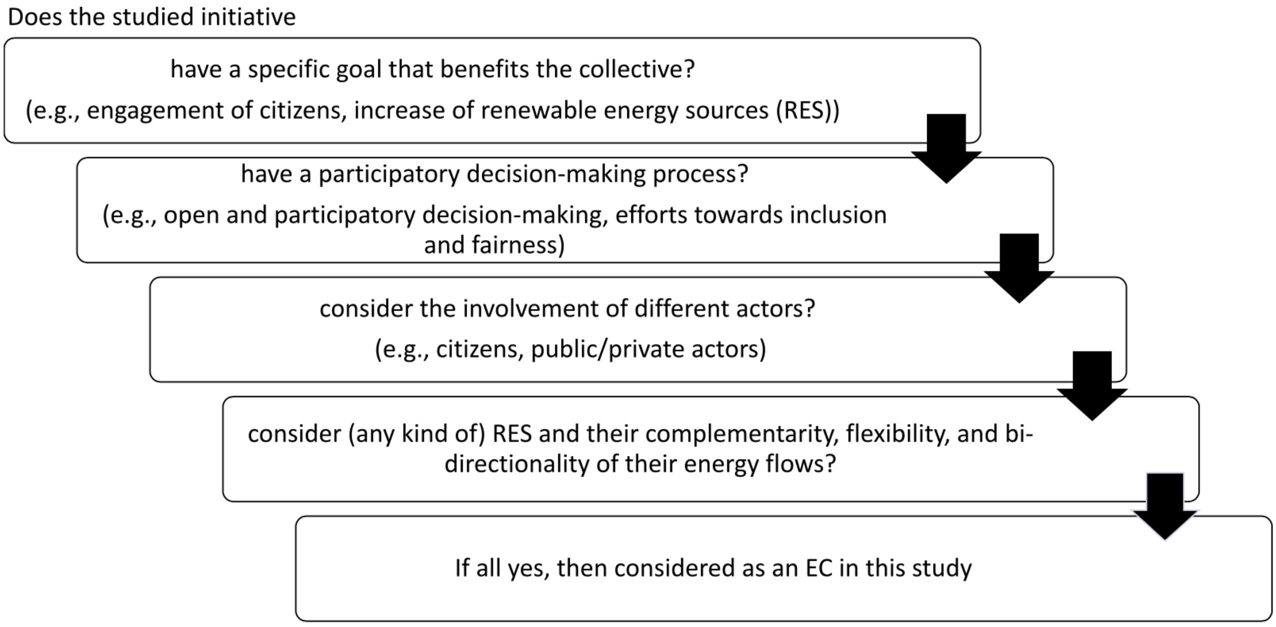

Figure 2 Source: Lode, M. L., te Boveldt, G., Coosemans, T., & Ramirez Camargo, L. (2022). A transition perspective on Energy Communities: A systematic literature review and research agenda. Renewable and Sustainable Energy Reviews, 163, 112479. https://doi.org/

It is beyond doubt that energy communities have the potential to generate many positive impacts, but it is also worth mentioning some of the possible adverse effects. As we have previously seen, further research has to be done on the risk that energy communities can impose costs on other actors, but another issue is worth mentioning. The stronger the positive effects generated by an energy community, the greater the reliance is when the installed technology fails to fulfill output targets, or when renewable energy subsidies run out in the future, reducing the money stream from RE (van der Waal, 2020). The risk of disillusion here is a key threat (Ibid). Not only must a means be found to maintain the revenue stream after the end of the technology's lifetime, but revenues and expectations may also be strained during the technology's anticipated operational years (Ibid).

Until recently, these types of initiatives did not have a clear status in EU and national legislation, taking different forms of legal arrangements (Caramizaru et al., 2020). However, the European Union has now adopted legislation to provide a standard definition of energy communities across all member states (Ibid). Therefore, the following section will analyze both the European and the Italian legal frameworks regulating energy communities.

3. European and Italian Law and Policy Framework to promote Renewable Energy Sources

3.1 European Law and Policy Framework

3.1.1 The EU's efforts to promote Renewable Energy Sources from the late 1970s to 2014

The European Union has a long history for what attains the promotion of renewable energy sources (Solorio & Bocquillon, 2017). Attempts to promote renewable energy sources began at the end of the 1970s (Nilsson, 2011). Following the two oil shocks, the then European Community (EC), the Council of Minister, and the newly established European Council asked for more research and development to find alternative energy sources to increase Europe's energy security (Solorio & Bocquillon, 2017). As a result, the EC adopted energy-saving objectives and a program to rationalize energy use, including renewable energy research, demonstrations, and regional applications (Twidell and Brice, 1992). During the 1980s, the promotion of renewable energy sources was incorporated into the EU's regional policy (Solorio & Bocquillon, 2017). Despite these efforts, it is worth mentioning that before the 1990s, large-scale investments in renewable energy sources were made by pioneer member states such as Denmark, Germany, and the Netherlands (Ibid). At the beginning of the 1990s, climate change started to gain a central position in the EU's agenda, giving a new impulse to promote renewable energy sources, which were now seen to address climate change (Morata and Solorio, 2012). RESs were seen as an instrument to cut CO2 emissions. As a result, a program with the following targets was introduced: 8% renewable energy sources in the EU energy consumption by 2005, tripling the amount of electricity deriving from renewable energy sources, and a target of 5% biofuels by 2005 (Solorio & Bocquillon, 2017). In its early stage, EU renewable energy support constituted mainly of R&D support policies (Hildingsson et al., 2012). In the meantime, some countries like Germany, Denmark, the Netherlands, and Spain were working on more ambitious policies that could go beyond R&D and support the market development of renewable energy sources (Solorio & Bocquillon, 2017).

In 1996 the Commission published a Green Paper on renewable energy sources (COM, 1996). A year later, the Commission published a white paper entitled "Energy for the Future: Renewable Sources of Energy" (COM, 1997). This document represented a turning point in the EU's renewable energy policy (Ibid). The white paper introduced an indicative target of 12% RESs in the EU's primary energy consumption by 2010 and measures to overcome obstacles in deploying renewable energy sources in various sectors (COM, 1997). In addition, both documents acknowledged the need to remove barriers to renewable energy sources trade (Lauber, 2005). This was very important because different support schemes were put in place for RES across member states with the risk of generating market distortions (Solorio & Bocquillon, 2017).

In 2000 the European Commission launched the European Climate Change Program to implement the Kyoto commitments. The promotion of clean energy sources was now framed as a solution to achieve the EU's climate commitments (Morata and Solorio, 2012). However, also external factors pushed for the adoption of such a program, such as the increase in the share of imported fossil fuels and rising concerns related to energy security (Solorio & Bocquillon, 2017). In this context, the Commission proposed two directives, one for promoting renewable electricity and one for biofuels. They were eventually adopted in 2001 and 2003 respectively.

The Directive on renewable electricity, though, was incapable of addressing the issues presented in both the green and the white paper. In particular, it did not address the harmonization of support schemes across the EU and did not fix any mandatory targets for the member states (Midttun and Koefoed, 2003).

Instead, the main objective set by the Directive was an indicative goal of 22,1% of renewable electricity in the total EU electrical consumption by 2010 (Solorio & Bocquillon, 2017). Similarly, to the renewable electricity directive, the one on biofuels left much freedom to member states for what attains support schemes and did not set any mandatory targets (Ibid).

From the mid-2000s onwards, renewable energy policy gained, once again, a prominent role in the EU agenda due to both internal and external factors. A review of the directives mentioned above showed that the indicative targets had proven to be ineffective (COM, 2007). Only a few countries showed adequate performance while the rest of the EU was lagging (Solorio & Bocquillon, 2017). Furthermore, rising concerns for energy security were highlighted by the 2006 gas crisis between Russia and Ukraine (Ibid). These events led the Commission to adopt a comprehensive energy strategy that highlighted the importance of RESs for climate change mitigation and the security of supply.

This led to the adoption, in 2009, of the Directive 2009/28/EC known as the Renewable Energy Directive (RED). This Directive amended both the Directive on renewable electricity and biofuels. It established a common framework to promote renewable energy sources, including electricity, but also transport, heating, and cooling (Ibid). It set a 20% target for renewable energy sources by 2020 and mandatory national targets for renewable energy sources in the final gross consumption of energy (Ibid). The Directive also introduced a mandatory flat target of 10% for the transport sector (Ibid). Implementing these objectives was left to member states who had to elaborate National Action Plans. Once again, the issue of harmonizing the different support schemes was not fully addressed (Ibid). It is worth mentioning that the Directive left the possibility to member states to elaborate joint support schemes, joint projects, and statistical transfers related to RES between states (Howes, 2010). In order to promote the adoption of RESs, the RED established that member states should provide at least guaranteed access, if not priority access, to the grid system for electricity produced through renewable energy sources (Solorio & Bocquillon, 2017). Furthermore, the RED allowed the import of renewable electricity from third countries (Ibid).

The contextual conditions of 2008-9 were crucial for adopting the RED (Ibid). The international climate negotiations and the EU’s will to present itself as a leader in the fight against climate change led to the quick adoption of ambitious targets (Wurzel, 2011). On the one hand, the RED established a more Europeanized structure of governance composed of binding targets and centralized monitoring procedures (Bürgin, 2015). On the other, it maintained decentralized governance, allowing members to adopt National Action Plans, which allowed member states to define their support schemes for RESs (Ibid).

The need to elaborate energy and climate targets for the post-2020 period has been driven mainly by the evolution of the international climate regime (Solorio & Bocquillon, 2017). Of particular relevance was the 2011 Durban agreement, which initiated the path towards a new agreement that would go beyond Kyoto (Ibid). The agreement was to be concluded at the Paris UN conference in December 2015 (Ibid). Nevertheless, the EU’s reputation as a champion in the fight against climate change had been undermined (Skovgaard, 2013). During the 2009 Copenhagen conference, participants did not manage to find an agreement, and the EU was side-lined by the US and China (Ibid). In addition to this, with the advent of the financial crisis, concerns arose about the cost of RESs support schemes. These were blamed for the rise in the electricity price (Solorio & Bocquillon, 2017). RESs support schemes have also been criticized for their cost because the price of some RESs technologies, like solar and photovoltaic, was drastically reduced due to mass production (Ibid). This was the context in which the 2030 goals were discussed.

Both the Commission and the Council were divided on the 2030 governance framework structure (Ibid). One part of the Commission, including President Barroso, DG environment, climate commissioner Hedegaard, and a fraction of DG Energy, agreed to continue with the 2020 approach by setting ambitious targets and imposing binding targets at the national level (Ibid). On the other hand, a substantial fraction of economists in DG Climate Action, together with Energy Commissioner Ottinger, favored the UK's request for a single GHG reduction target (Ibid). This target would have been achieved through a reformed emissions trading scheme in a "cost-effective" and "technology-neutral" way (Ibid). This view was shared by those member states that were lagging behind the 2020 targets (Uk and France) and those who were afraid of the necessary costs to readapt their economies (Visegrad group).

The final agreement for the 2030 climate and energy framework reflected both views. It envisaged a 40% reduction of greenhouse gas emissions, and at least 27% of the total amount of the energy produced must come from renewable resources (Ibid). Despite these ambitious targets, no binding targets for the member states were set. It is worth mentioning that steps beyond have been taken to harmonize RES support schemes (Ibid). Framing them within the internal market policies (Jacobs, 2015), the commission indicated which support schemes were allowed and which were not.

3.1.2 The Energy Union Strategy

Despite the EU's efforts to tackle climate change and promote renewable energy sources, community energy and energy communities did not enter the EU's agenda until 2015. Already in the late 70s local communities started to organize community-based renewable energy projects (Roberts, 2020). The path to developing legislation on Energy Communities and collective self-consumption in general stems from the publication in February 2015 of the "Energy Union Strategy" by the European Commission, which aims to strengthen and improve the energy service for EU consumers by making it more secure, sustainable, competitive, and cost-effective (Maps Group, 2021). The Commission's "Energy Union Package" is a strategic document that aims to create an integrated European energy market where member states collaborate to improve their energy security, decarbonize their economies, and reduce energy waste (Siddi, 2016). Making the EU more climate-friendly and decreasing its reliance on external energy providers are the broader objectives of the Energy Union (Ibid). The Energy Union Strategy outlines five main policy objectives which are closely interrelated (Ibid): 1) Increasing energy security, solidarity, and trust, 2) Creating a fully integrated European energy market, 3) Improving energy efficiency while at the same time moderating the energy demand, 4) Decarbonizing the member states' economies and 5) Supporting research innovation and competitiveness

Some of the outlined objectives have always been of primary importance for the European Union, mainly creating a fully integrated energy market and reducing dependence on energy suppliers abroad (Ibid). On the other hand, some objectives are new, like the focus on innovation and the technological advancement of energy supply systems (Ibid).

The proposal to create an EU Energy Union Strategy was first made by Donal Tusk (former polish prime minister and president of the European Council) in April 2014 (Ibid). Tusk was primarily concerned with the EU energy dependency on Russia (Ibid). His proposal stressed the need to exploit domestic fossil fuels and the need to create a joint European gas purchasing authority. Tusk’s proposal must be read in light of what was happening in 2014. Russia had invaded and subsequently annexed Crimea that year. This put the EU on a confrontational path with Russia one of the primary energy providers.

On the one hand, the Energy Union strategy indeed reflects concerns about the dependency on Russia, but on the other hand, its objectives are broader (Ibid). The Energy Union Strategy also builds on previously adopted legislation, such as the 2009 Third Energy Package (Ibid). This package was composed of a series of regulations and directives outlining standard rules for both the electricity and gas markets. The main aim was to integrate and open up member states’ gas markets (Ibid). Most importantly, the EU’s climate goals and the idea of sustainable economic development have profoundly shaped the Energy Union Strategy (Ibid). Since the focus of this thesis is on energy communities, only the aspects related to the decarbonization of member states’ economies will be further discussed.

To pursue the “Energy Union Strategy,” several packages of measures have been published: central is the Clean Energy for all Europeans Package (CEP), first published in November 2016 and completed in March 2019. This package aims at implementing measures that keep the European Union competitive while the clean energy transition is reshaping global markets (Capros et al., 2018). It leads to a comprehensive update of the European energy policy framework while also contributing to the EU’s long-term strategy to achieve decarbonization by 2050. Furthermore, the proposed policies align with the 2030 targets agreed by the European Council for greenhouse gas emissions reduction, renewable energy, and energy efficiency (Ibid). These targets must be pursued while at the same time putting citizens at the center of the energy transition (Roberts, 2020). Furthermore, the document promotes the transition to a decentralized energy system. End consumers play an active role; energy communities are mentioned here for the first time, highlighting their economic and social benefits for citizens (Maps Group, 2021). In addition, the “Clean Energy for all European Package” contains legislative acts and non-legislative initiatives focusing on self-consumption and energy communities (Ibid).

Two directives are worth mentioning within the Clean Energy Package: The Renewable Energy Directive 2018/2001 (RED II), published in December 2018, and the Directive on standard rules for the internal market for electricity 2019/944 (IEM), published in June 2019.

3.1.3 The Renewable Energy Directive 2018/2001 (RED II) and the Directive on standard rules for the internal market for electricity 2019/944 (IEM): First Definitions of Energy Communities

The primary purpose of the RED II Directive is to increase the share of energy produced from renewable sources in the European Union and increase public involvement in new renewable energy projects (Maps Group, 2021). The Directive, therefore, places a constraint on the type of plants that will be part of the new configurations defined by it, which can only be plants powered by renewable sources. Another key objective of the Directive is to address the problem of energy poverty, encouraging the inclusion of vulnerable customers in the path towards energy transition. Within this Directive, "Renewable Energy Communities" (RECs) and "jointly-acting renewable self-consumers" have been defined.

Instead, the primary purpose of the IEM Directive is to adapt the EU electricity market to the technological and structural changes taking place in recent years (Ibid). Therefore, the configurations introduced refer only to the production and exchange of electrical energy - produced from renewable or traditional sources - and new actors are allowed to participate in the energy market. Furthermore, within this Directive, the definition of "CEC" Citizen Energy Community and "jointly-acting active customer" is provided. This configuration, though, will not be analyzed explicitly within this dissertation.

Although collective self-consumption has already been recognized in some national EU legal frameworks or under pilot projects, this is the first time this concept has been formally recognized in legislation at the EU level. This is a turning point for the European energy market.

Now let us look more in detail at the definitions of these new types of configurations. Let us start with the configurations listed in the RED II Directive. The definition of *Renewable Energy Community* (REC) can be found in Article 2(16). A renewable energy community is a legal entity that is based on open and voluntary participation and is autonomous. It must be effectively controlled by shareholders or members located near the renewable energy plant/s owned and developed by the legal entity itself. Within the same directive, Article 2(16) lists a series of actors that can be part of RECs. These are natural persons, SMEs, or local authorities, including municipalities. The primary purpose of the REC must be the delivery of economic, social, and environmental benefits for its shareholders or members or for the local areas where the entity operates rather than financial profits.

Even if it is not part of the definition, RECs are entitled to produce, consume, store, and sell renewable energy through renewable power purchase agreements, share renewable energy within the community, and access all suitable markets. These provisions can be found in article 22 (2) of the RED II Directive. Article 22(2) poses the obligation on member states to ensure that renewable energy communities are entitled to produce, consume, store, and sell renewable energy. RECs should also be entitled to share the renewable energy produced within the legal entity. Furthermore, the members should maintain their rights and obligations as customers. Finally, RECs should be allowed access to all suitable energy markets in a non-discriminatory manner.

Let us move on to analyze the definition of jointly acting renewables self-consumers which can be found in Article 2(15) of the RED II Directive. Jointly acting renewables self-consumers must be understood as at least two jointly acting renewable self-consumers who are located in the same building or multi-apartment block. Article 2(14) defines renewables self-consumers as a final customer who produces energy for his consumption and therefore may store or sell self-generated renewable energy. If a renewables self-consumer is not a household, this activity cannot constitute its primary commercial or professional activity.

The following paragraphs instead will analyze the definitions of Citizen Energy Communities and Jointly Acting final consumers which can be found in the IEM Directive. The definition of Citizen Energy Community (CEC) can be found in article 2(11). CECs are legal entities based on voluntary and open participation. They must be effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises. Its primary purpose must be to deliver social, environmental, and economic benefits to its member or shareholders or the local areas in which it operates rather than generating financial profits. CECs may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services, charging services for electric vehicles, or other energy services to its members or shareholders.

The definition of jointly active final customer, instead, can be found in article 2(8). Active customers must be understood as final customers or a group of final customers who consume or store self-generated electricity or sell or participate in flexibility or energy efficiency schemes. However, these activities may not constitute its primary commercial or professional activity.

There are several commonalities in what attains the definitions of RECs and CECs. In the first place, both definitions describe a new way to organize energy production collaboratively with specific ownership, governance, and non-commercial purpose. In the second place, in both configurations, the primary objective is to deliver environmental, social, and economic benefits to the community, not to pursue financial profits. In the third place, both definitions emphasize participation and effective control by citizens, local authorities, and smaller businesses whose primary economic activity is not in the energy sector. Lastly, participation in CECs and RECs must be open and voluntary.

The differences between CECs and RECs, instead, help us understand the relationship between these two configurations. Renewable Energy Communities can be seen as a subset of Citizen Energy Communities. As we can see from art 2(16) of the RED II Directive, RECs have a narrower geographical scope than CECs. Furthermore, these two configurations differ concerning the actors who can control the energy community. SMEs can effectively control a REC, while this is limited to small and micro enterprises in the case of CECs. Furthermore, the RED II directive poses more substantial obligations on member states than the IEM directive’s obligations concerning CECs. In fact, in particular, the RED II Directive requires the Member States to develop national ‘enabling frameworks’ to promote and facilitate the development of RECs, including also capacity building, tools to facilitate access to finance and information, ensuring access to vulnerable and low-income households, and remove unjustified regulatory and administrative barriers. In addition, member states must also consider RECs when designing their national renewable energy support schemes. In exchange for these additional benefits, the eligibility requirements for qualifying as a REC are more restrictive.

This distinction between RECs and CECs is coherent with the objectives of the RED II Directive and the IEM Directive. The RED II objective is to increase the share of energy produced from renewable sources in the EU and increase public involvement in new renewable energy projects (Lowitzsch et al., 2020). The IEM, instead, focuses on adapting the EU electricity market to the technological and structural changes taking place in recent years and completing the internal market (Ibid). These two objectives are also clearly visible in the relationship between "jointly acting renewables self-consumers" and "jointly active final customers." The former differs from the latter mainly because of renewable electricity. However, it is worth saying that due to the objectives of the thesis, these two configurations will not be explicitly analyzed. Instead, the main focus will be on RECs.

The following section will be dedicated to analyzing the efforts done by Italy to promote renewable energy sources and the legislation introduced to implement the RED II.

3.2 Italian Law and Policy Framework

This section will be dedicated to analyzing the Italian law and policy framework for the promotion of renewable energy sources. Before starting the analysis, it is worth mentioning that data related to the policies implemented in Italy are both scarce and fragmented; hence, an adequate reconstruction of such policies is not a simple task (Ernesto Cassetta & Giuseppe Surdi, 2011). Despite these limitations, this section will try to outline the central policies adopted to promote renewable energy sources. For this section to be coherent with the previous one, it will be divided into two subsections. The first one will deal with the primary laws and policies adopted before the RED II transposition process. The second one instead will deal with the primary laws and policies adopted for the implementation process of the RED II.

3.2.1 Efforts to promote Renewable Energy Sources: the pre-RED II phase

The share of renewable sources in gross final energy consumption, relevant for applying Directive 2009/28/EC (RED), was 9.5% in 2009, significantly higher than the 6.8% percent registered in the previous year (Ernesto Cassetta & Giuseppe Surdi, 2011). However, this highly positive data should be read in light of the economic crisis that led to a sharp contraction in energy consumption.

A similar argument can be made about the environmental impact of energy production. Climate-altering emissions associated with electricity and heat production have passed from a 0.6% yearly growth in the period 2000-2007 to a decrease in 2008 and 2009 by 4.6% and 14.4%, respectively (Ibid). Although it is currently challenging to disentangle the effects of the economic crisis, the growth of renewable sources was nevertheless sustained and mainly attributable to a 46,5% increase over the period 2000-2010 in green power generation (Ibid). Relatively greater weight in the described trend was given to so-called new renewable sources, such as wind, photovoltaics, and biomass, whose overall contribution to electricity production from renewable sources rose from just under 4.9% in 2000 to 25.7% in 2010 (Ibid).

The growing deployment of electric renewables in Italy results from a relatively broad set of support instruments. The extreme variety that has characterized the current regulatory framework should be traced back to a routine activity of reviewing incentive schemes (Ibid). This fragmented approach is mainly due to two aspects. The first one is the absence of an autonomous path for developing renewable sources; Italy has mainly responded to commitments taken by the EU (Ibid). Second is the constant dissatisfaction with the results achieved by the models adopted from time to time (Ibid).

A thorough analysis of individual incentive mechanisms and their evolution over time is beyond the scope of this thesis. However, it is sufficient to recall how, both at the theoretical and policy level, the fundamental distinction is between quantity-based mechanisms and price-based mechanisms. The former imposes an obligation to purchase energy produced from renewable sources (quota system or Renewable Portfolio Standards), which is often associated with a system of tradable certificates (so-called green certificates) to separate compliance with the obligation from the physical production of energy. The latter's rationale is the remuneration of electricity produced from renewable sources through a purchase tariff or a premium added to the market price (Renewable Feed-In Tariffs).

Concerning our country's experience, it is interesting to point out the circular path followed, which, starting from a feed-in type incentive scheme, initially envisaged in CIP (inter-ministerial price committee) measure no. 6/1992 (Ibid). Subsequently, a green certificate system was introduced, which was then abandoned in favor of a new feed-in tariff scheme (Ibid). Such a scheme had been previously adopted in its two main variants for solar photovoltaic (so-called "Conto Energia") and subsequently for small-scale plants (so-called "All-inclusive tariff"). Moreover, the Legislative Decree No. 28 of March 3, 2011, the so-called "Renewables Decree," which transposed Directive 2009/28/EC (RED), prescribed that for larger plants, the level of the tariff would have been determined through a public auction mechanism. Hence completing the range of theoretically implementable support policies (Ibid).

The incentive schemes described so far are not the only measures implemented to support energy production from renewable sources. Specific actions of a less structured nature have been adopted at the national and local level and funded through ministerial resources or EU funds, generally articulated in capital grants in favor of specific categories of subjects and technologies (Ibid). Estimating the overall resources made available by these initiatives is undoubtedly more complex given their fragmented nature and the absence, in most cases, of organic forms of reporting on the funding disbursed and the progress of individual programs (Ibid).

A similar approach has also characterized the gradually increasing introduction of support actions at the local level, generally from the resources made available by the Community Structural Funds (Ibid). Most of the EU funds allocated to energy-environmental issues have been directed to the construction of facilities for the production of electricity from renewable sources. In 2008, almost 63% of the total resources committed to energy-environmental issues in the 2000-2006 programming period (equal to 1.3%of the total endowment) were directed to the financing of generation plants from renewable sources, especially solar (23%), wind (21.3%) and biomass (15%) (Ibid). The 2007-2013 programming cycle reserves more attention for energy-environmental issues, allocating about 4.1 billion euros (6.9% of the total resources), signaling a changed approach in the intervention focusing on energy efficiency and energy-saving, no longer limited to demand support (Ibid).

As previously stated, Italy has mainly responded to international and European commitment rather than promoting an autonomous strategy. For this reason, there have been no significant changes until the arrival of the Clean Energy For All package. However, due to the scope of this thesis, the following section will focus on the implementation of the RED II.

3.2.2 A new scenario: transposing the RED II

Italy has started to transpose the RED II Directive to include the configurations introduced at the European level in the Italian regulatory framework. The path began with the Decreto Milleproroghe, which came into force in February 2020. The definitions of “Self-consumers of renewable energy acting collectively” and “Renewable Energy Communities” were introduced in Italian legislation. The path then continued with the publication of ARERA Resolution 318/2020 (August 2020), the MiSE Implementation Decree (September 2020), and the “Gestore dei Servizi Energetici” (GSE) Technical Rules (December 2020).

3.2.2.1 Decreto Milleproroghe

On February 28, 2020, the Milleproroghe 2020 decree was definitively approved. Art. 42-bis aims to activate the configurations of REC and collective self-consumption of renewable energy, anticipating the timeframe for the transposition of the RED II directive and thus introducing a pilot phase. Therefore, it should be borne in mind that what was defined by the Milleproroghe was not definitive. The definitions of “self-consumers of renewable energy acting collectively” and “renewable energy communities” are introduced in the decree by directly quoting the definitions given by the RED II Directive, therefore without substantial changes.

In the case of collective self-consumers, users who can become members of these configurations are end customers whose activities related to self-consumption do not constitute their main professional or commercial activity. For what attains renewable energy communities members can be SMEs, or local authorities, provided that this does not constitute their main professional activity.

The plants that are part of these two configurations can produce electricity from renewable generation technologies only, and with plants with a total capacity not exceeding 200 kW. Furthermore, the decree’s provisions apply to plants that come into operation between February 28, 2020, and 60 days after the transposition of the RED II Directive (to be carried out by June 2021).

The concept of proximity applies differently whether we consider collective self-consumers or renewable energy communities. In the first case, members must belong to the same condominium building. In the second case, members must be located and must belong to the same secondary cabin.

The activities allowed for the two configurations are those of production, sale, storage, and sharing, within the community, of the energy produced. The sharing of the energy produced takes place using the existing distribution network. Therefore, the decree does not foresee the creation of new grid sections nor the transfer of part of the current public grid for private use by the community.

It is crucial to stress the fact that the concept of shared energy is defined, in fact, according to a "virtual" approach. The energy produced by the plant, which is fed into the grid and consumed instantaneously by the members, is considered shared energy.

For the shared energy, the decree foresees some incentives. In the first place, the exemption from those tariff components that are not technically applied to the shared energy. The determination of the value of the components not applicable to shared energy is entrusted to ARERA. The document that contains this information is ARERA Resolution 318/2020, which will be discussed later on. In the second place the introduction of an incentive tariff "aimed at rewarding instantaneous self-consumption and the use of storage systems." The determination of the incentive schemes is instead the task of the Ministry for Economic Development. The incentive schemes were defined with the implementation decree of September 15, 2020, which will be analyzed later on.

3.2.2.2 Delibera ARERA

Resolution 318/2020 of August 4, 2020, governs the terms and economic regulation relating to shared electricity, as determined by the Milleproroghe Decree. Below are the main changes introduced by this document, considering what had already been defined in the Decree Milleproroghe 2020.

Within the configurations of self-consumers acting collectively to determine the shared electricity, the consumption of individuals who are not part of the configuration may also be relevant. This may occur, provided that they are within the confines of the configuration and if they issue a release to allow the use of their data related to electrical consumption. In addition, the configuration of renewable energy communities or self-consumers acting collectively may also include the sections of production facilities that are newly built as part of the expansion of an existing production facility, provided that the electricity produced by them is metered separately.

The ownership of the plants is free: in the case of collective self-consumption, the ownership can be of a third party, provided that it is subject to the instructions of the self-consumers. Instead, in the case of renewable energy communities, the ownership can be of a third party. However, the community must hold the plant according to a legal title even different from ownership.

ARERA's resolution also defines the figures of "contact person" for the configuration, responsible for relations with the "Gestore dei Servizi Energetici" (GSE), and "producer," responsible for the operation of the production plants within the community. The “contact person” of the configuration is, In the case of a group of self-consumers of renewable energy acting collectively, the legal representative of the building or condominium, or a producer of electricity that operates one or more production facilities that belong to the configuration; In the case of a renewable energy community, the community itself (the legal entity).

The “producer” is an individual or legal entity that produces electricity regardless of the ownership of the production facility. He is the holder of the plant and the authorization for the construction and operation of the production plant. In particular, in the case of a group of self-consumers of renewable energy acting collectively, the plant may be owned and/or operated by a third party, as long as it remains subject to the instructions of the group of self-consumers. In the case of a renewable energy community, the production facilities may be operated by the legal entity itself or by one of its members, or by a third-party producer. However, they must be owned by the renewable energy community (i.e., it has ownership or full availability based on a legal title other than ownership, such as usufruct or right of use).

3.2.2.3 Decreto attuativo MiSE

The implementing decree published by the Ministry of Economic Development on September 15, 2020, identifies the incentive tariff for the remuneration of the energy produced by renewable source plants included in the above configurations and shared internally among members. In the case of collective self-consumption, the incentive for the shared energy is 100 €/MWh. In the case of renewable energy communities, the incentive is 110 €/MWh. Moreover, the total energy produced by the renewable energy plant flows into the grid. For this reason, the energy that is not shared can be sold to the GSE.

Suppose the system producing the configuration is a photovoltaic system installed simultaneously as efficiency works that allow the upgrade of two energy classes for the building on which it is installed. In that case, it can benefit from the “Superbonus 110%” for the first 20 kW of installed power. However, this incentive cannot add to the incentive on shared energy described above: the shared electricity underlying the share of power of the plant that has access to the Superbonus will be valued only with the return of transmission and distribution charges provided by the regulation of ARERA.

The portion of power above 20 kW that has access to the 110% Superbonus (or the entire plant, if it has not had access to the 110% Superbonus), can benefit from the ordinary bonus (“Ecobonus”), which provides for the repayment of 50% of the investment made.

The national regulatory measures have allowed the activation of the pilot phase prior to implementing the RED II Directive. This transposition should have been completed by June 2021, but this was not the case. As a result, the transposition of the RED II Directive sees the revision of certain “constraints” currently envisaged, consistent with the current transitory nature of the regulatory regime in force.

3.2.2 Implementation of the RED II (Directive 2018/2001) and IEM (Directive 2019/944).

Following the opening on July 26, 2021, of ten infringement procedures by the EU Commission against Italy for failure to transpose European directives within the prescribed time, on August 5, the Council of Ministers approved in a preliminary and not final way the implementing decree of several directives including precisely the RED II and IEM (Maps Group, 2021).

The measure has been drafted according to the National Integrated Plan for Energy and Climate. It intends to accelerate the ecological transition further to achieve the objectives set. RED II establishes that by 2030 at the European level, renewable energies must account for at least 32% of gross final energy consumption.

The main measures envisaged in the decree are the following. In the first place, the simplification of authorizations for renewable energy-based plants, which are currently very slow and complicate the implementation of projects. In the second place, the simplification of access to incentive mechanisms and the introduction of a five-year plan to provide stability and encourage investment in the sector. In the third place the access to the incentive scheme also to powerplants with a capacity of no more than 1 MW. Another issue that has been touched upon is the promotion of the combination of renewable sources and storage systems and the installation of photovoltaic systems with asbestos removal. The decree also envisages the creation of a one-stop digital shop to coordinate and digitize all the fulfilments required for the issue of authorizations.

On December 15, 2021, the Legislative Decree that definitively transposes the two directives RED II (2018/2001) and IEM (2019/944) entered into force (Maps, 2021). With this step, Italy is finally about to conclude adopting legislation on renewable energy resources and energy communities. Let us focus on the most important aspects the decree has introduced concerning RECs.

This step makes it possible to complete the legislation and thus enable the development of energy communities on a large scale. Two main elements enable this step. Firstly, the increase of the power limit of plants eligible for incentive mechanisms from 200 kW to 1 MW, and secondly the removal of the secondary cabin limit, allowing the establishment of RECs with members connected to the primary cabin. The decree confirms the possibility for these plants that are part of energy communities or self-consumption groups to access a direct incentive that rewards instantaneously self-consumed energy through a specific tariff.

Regarding the Regulation of Incentives for Energy Sharing, in Article 8, the incentive mechanisms for renewable-based plants included in collective self-consumption configurations or renewable energy communities with a capacity not exceeding 1 MW are updated. Renewable source plants that have a capacity of no more than 1 MW and that start operation after the date of entry into force of this decree are eligible for the incentive. For self-consumers of renewable energy acting collectively and in renewable energy communities, the incentive is disbursed only concerning the share of energy shared by plants and consumption utilities underlying the same primary cabin. The incentive, as in the previous decree, consists of a tariff attributed only to the share of energy produced by the plant and shared within the configuration.

Furthermore, the combination of renewable sources with energy storage systems is also promoted to allow for greater programmability of sources. Finally, the conditions of cumulability with the tax benefits provided for the construction of the plants and storage systems and other support schemes are established. This has been done considering the different subjective and plant characteristics. The principle of an overall fair remuneration for the interventions is guaranteed.

Despite adopting the above-mentioned Legislative Decree, the implementation on a large scale of energy communities is still in a stall. This is because we still have to wait for the publication of the implementing measures of the legislative decree transposing the RED II directive: an ARERA resolution and a MiTE (Ministry of the Ecological Transition) decree.

Before moving on to the next section, it is worth underlying some key aspects. First of all, the primary purpose of renewable energy communities is to deliver economic, environmental, and social benefits rather than pursuing financial profits. The IEM and RED directives frame energy communities as non-commercial actors who use their revenues to deliver services and benefits to the local community (Caramizaru et al., 2020). This legal provision translates into the impossibility of the legal entity underlying the Renewable energy community to keep profits; hence, it must either distribute them among its members or reinvest them. The Renewable Energy Community decides the selected criterion for distributing the benefits through a private law contract (Enel X, 2020).

For example, profits deriving from the sale of excess energy can be shared equally. However, when redistributing the incentives, it is possible to privilege those who have worked to ensure that their consumption was simultaneous with the plant's energy production.

4. Energy Communities: Current trends

To analyze the current trends in the energy community sector the 2021 Electricity Market Report performed by the Energy Strategy group, a permanent observatory of the Politecnico di Milano, has been used as a source of data. This is because, to date, it is the most comprehensive analysis of the main characteristics of existing energy communities. Furthermore, it uses the most relevant methodologies present in the literature.

Currently, there are twenty-one renewable energy communities (Energy & Strategy Group, 2021). This number considers those already operating and those in the planning stage (Ibid). Despite the reference to renewable energy in art 2(16) of the RED II Directive, in Italy, photovoltaic panels are currently the most diffused clean energy production method. It was found to be used in 96% of the analyzed initiatives (Ibid). The remaining 4% of clean energy is hydroelectric or biomass (Ibid). These energy sources are used both independently or in combination with photovoltaic plants. Section number four will proceed by analyzing the following main points: actors involved, activities that need to be carried out to give birth and manage energy communities, value proposition, financing, and benefit distribution mechanisms. The last sub-section will be dedicated to describing the main clusters that have emerged according to the previously mentioned dimensions.

4.1 Actors Involved

Within the analysis carried out by the Energy & Strategy Group, five core roles have been individuated when creating a Renewable Energy Community:

1. The promoter: actor/s who promote/s and implement/s the realization of the project.
2. The members: actors who are part of the legal entity. Their electrical consumption is used to calculate the amount of shared energy.
3. The producer: Responsible for managing the community's power generation facilities.
4. The contact person with the GSE: Manages the relations with the GSE. Is responsible for registering the configuration and requesting access to the incentive scheme.
5. The financer: actor/s who provide/s the funding to start the project

Along with these five core actors, some supporting actors may be present (Ibid):

1. Research institutions: entities that can participate in the development of the initiative by providing their knowledge to support the creation and management of the aggregate, also to collect data to support their research projects.
2. Non-profit organizations: non-profit entities that promote the establishment of energy communities as a tool for the social development of the territory.
3. Energy player: an entity that can participate in developing the initiative by providing its knowledge to support the creation and management of the cluster. Energy players can be, for example, a utility or an ESCO.
4. Technology supplier: supplier of the technologies underlying the operation of the aggregate (power generation plants, measurement instruments, management platforms, etc.). May also be among the promoters of the initiative.
5. Credit institution: an entity that can participate in developing the initiative by supporting all or part of the investment necessary to realize the energy community.

Other fundamental actors are DSOs (Distribution System Operators) and the GSE. The former is fundamental in the project's initial phase because it can tell whether the members of the renewable energy community all belong to the same secondary cabin. The latter, instead, is responsible for the activation of the incentive scheme for the shared energy.

4.2 Activities that must be carried out to give birth to a Renewable Energy Community

The main activities necessary to give birth to a renewable energy community can be divided according to three dimensions: bureaucratic, economic, and technical (Ibid). Once more, according to the stage in which the initiative is, it is possible to divide the actions into ones necessary to activate the initiative and those necessary to manage it (Ibid). Therefore, let us describe the activation phase according to the three dimensions.

Two fundamental activities must be carried out in the initial phase when considering the bureaucratic dimension (Ibid). The first one is the engagement of the potential members. This activity mainly promotes the initiative on the territory, collects adhesions, identifies the most suitable categories of users for the physical self-consumption and the shared energy, and identifies those users who respect the geographical constraints imposed by the regulatory framework. The second one is activating the configuration. This activity consists of creating the aggregate's legal entity and communicating to the GSE the intention to establish an energy community.

Furthermore, considering the economic perspective in the initial phase, it is fundamental to choose an adequate funding mechanism. Lastly, considering the technical dimension, fundamental activities are the techno-economic planning and installing the technologies. These activities include sizing the production facilities, choosing additional assets to be included (storage, measuring instruments, electric charging stations, etc.), involving technology providers, and installing the technological assets.

For what attains the management activities, when considering the bureaucratic dimension, a fundamental activity is managing new entries/exits of members from the legal entity. When considering the economic dimension instead, a fundamental activity is managing members entering and leaving the aggregate and internal allocation of economic benefits. Lastly, when considering the technical dimension, fundamental activities are the maintenance of the assets and any new design phase to adapt the aggregate to changes (e.g., change in the number of members).

4.3 Value Proposition

As stated above, the European RED II Directive defined the primary objective of renewable energy communities as providing community-based environmental, economic, or social benefits to its shareholders or members or to the local areas in which it operates rather than financial profits. By analyzing existing and in the planning stage renewable energy communities in Italy, it can be seen that the motivations underlying the birth of RECs are coherent with what is written in the RED II Directive and can be summarized as follows (Ibid):

	ECONOMIC BENEFITS	SOCIAL BENEFITS	ENVIRONMENTAL BENEFITS
Reduction of energy related expenditure		Contrasting enrgy poverty	
Promote energy efficiency		Contrasting enrgy poverty	
Pursue a profitable investment			
Generate a positive impact on the territory			
Contributing to environmental sustainability			

Figure 3 Benefits of Renewable Energy Communities

These objectives can be pursued singularly or in conjunction. If a public body promotes the initiative, its motivations are typically to generate savings for citizens and create value for the territory (Ibid). If the promoter is an energy player, instead, the primary motivation is the pursuit of a business opportunity, which implies the promotion of energy efficiency initiatives (Ibid). Now let's suppose that citizens and SMEs promote the initiative. In that case, the primary intent is to reduce energy expenditure and the desire to contribute to the more significant environmental sustainability of their consumption (Ibid).

4.4 Financing

For what attains financing, several possibilities can be used both singularly or in combination (Ibid):

- Non-repayable funding from a public entity: municipal, regional, national, and/or community funds are used to finance initiatives without the obligation to repay the capital provided.
- Financing from energy player: the energy player is responsible for bearing part or all of the investment required to install the enabling technologies.
- Financing from a non-profit actor: the non-profit organization is responsible for bearing part or all of the investment required to install the enabling technologies.
- Investment by the member themselves: the initial investment can be borne directly by private citizens or SMEs that will later become members of the initiative. A bank loan can cover part of the investment (or the entire investment).
- Transfer of credit/discount on invoice associated with tax deductions: "Superbonus" (110%) or other tax deductions (50%) can be used, if certain conditions are met, to mitigate the initial investment through credit assignment or invoice discounting.

A potentially promising financing opportunity that has not yet seen a concrete implementation concern crowdfunding and crowdinvesting (Ibid). In this case, stakeholders external to the initiative can invest and finance the development of the aggregates in a disinterested manner or by benefiting economically from the same investment.

4.5 Benefits distribution mechanisms

Significant heterogeneity also emerges concerning the methods of sharing the benefits associated with creating an aggregate, with reference to incentives for shared energy and the valorization of electricity fed into the grid (Ibid). These methods can be either pursued individually or combined. A distinction must be made between benefit-sharing mechanisms. These can be among the actors involved and among the members. In the first type of benefit-sharing mechanism, the economic benefits can be shared only among members, partially reinvested, or shared with a market actor. In the second type, economic benefits can be shared according to the value in thousandths of the building belonging to each member of the renewable energy community, based on the shared energy or per capita.

4.6 Existing clusters

From the analysis carried out, three clusters of renewable energy communities have emerged; the following table summarizes them (Ibid):

	CLUSER 1	CLUSTER 2	CLUSTER 3
Promoter	Local municipality and other public or non-profit entities	Energy Player	Members (Citizens and SMEs)
Value Proposition	Generating a positive impact on the territory, contrasting energy povery, reduce energy related expenditure	Business opportunities, promotion of energy efficiency	Reduce energy related expenditure and contribute to environmental sustainability
Members	Citizens, SMEs, Public Administration's utilities	Citizens, SMEs, Public Administration's utilities	Citizens, SMEs
Investment	Public funds, foundations/saving banks	Investment by the promoter, investment by the members	Investment of the members
Distribution of economic benefits	All the benefits to the members or a small part to the energy community itself	Part of the benefits to the energy player and part to the members	All the benefits to the members

Figure 4 Existing Clusters of Renewable Energy Communities

Cluster 1 - Public bodies and third sector organizations - is the most widespread and is based on the direct relationship between citizens and local public bodies (with the latter acting as a "catalyst" for the initiative) and the possibility of benefiting from non-repayable or subsidized financing. These initiatives are created to mitigate energy poverty and generate economic value in the area. They are also a possible tool for the requalification of social housing. The systems can be placed on public buildings and physically connected to the utilities of the local public authority. It is crucial to involve local companies to simplify the cluster's technical after-sales management. This cluster is characterized by limited technical and energy expertise among promoters and members and significant "bureaucracy" resulting from the presence of the public administration, which makes this model not very scalable in the market in the long run.

Cluster 2 - Energy Player - the initiative comes from an energy player, often involving the local municipality, to exploit the knowledge it has of the area and direct contact with citizens. The plants can be placed on buildings made available by the municipality or on buildings of private citizens or SMEs. In the first case, the investment is carried out in full by the energy player, while in the second case, there is the participation of citizens and SMEs (who can benefit from tax deductions). In both cases, the energy player provides technical expertise, whose presence can facilitate the scalability of the initiatives if it can find a sustainable setup from a technical and financial point of view. However, this will require the energy player to retain part of the value generated by creating these configurations.

Cluster 3 - Private citizens - the investment is sustained entirely by citizens and SMEs, who can take advantage of tax breaks and bank financing to support them. This case study is theoretically the least articulated, given the limited number of players involved, and is characterized by the division of economic benefits among only the members of the renewable energy community. Despite this, it is the least diffused configuration because it requires that citizens and/or SMEs are willing to support the entire investment and be aware of the opportunity and the ability to evaluate it appropriately.

5. Analysis of a REC's Business Plan

Since the project proposed within this thesis aims to create an entity that collects capital generated by existing RECs to invest in creating new ones, it is necessary to analyze the business plan of a REC. Before describing the ideal REC's business model, it is worth saying that this is not the only type of REC with which the newly born organization will enter into contact. However, given the current Italian legal framework, this type of configuration is the one capable of generating more revenues.

The assumptions made to analyze this business model are based on the 2021 Electricity Market report published by the Energy & Strategy Group, a permanent observatory within the Politecnico di Milano, and on personal work experience in the sector. The assumptions made are summarized in the table below.

Assumptions		
Members	6	
Sunlight Exposure	1250	Hours
Plant Size	200	kWp
Cost per kWp	1000	€
% of efficiency reduction of thr plant	0,05%	
Shared energy per member	30000	kWh
MITE Incentive	110	€/MWh
Price of Energy	60	€/MWh
ARERA Incentive	9	€/MWh
Economic Benefits distributed	10%	
% of physically consumed energy	20%	
Annual interest rate	7,0%	
Years to repay the loan	8,00	
% of shared energy	90%	

Figure 5 Assumptions for the 200 kW renewable energy community

In this case, we are considering an energy community in which members are SMEs. This is because we are considering a photovoltaic plant of 200 kW. Considering that 1 kW occupies more or less 6 m2, the roof would have to be 1200 m2. Other subjects with these characteristics could be public authorities with more space on their building's roof. The members in this energy community are six and manage to consume 30000 kWh of shared energy each (LEAPS4SME, 2021). This means that 30000 kWh is the energy they can consume when the photovoltaic plant produces energy. More specifically, this is the energy consumed in "Fascia 1" and part of "Fascia 2". Fascia 1 refers to the energy consumed between 8 am and 7 pm from Monday to Friday, excluding national holidays. Fascia 2 instead refers to the energy consumed from 7 am to 8 am from Monday to Friday and from 7 am to 11 pm on Saturdays. In the case analyzed in the business model, 1250 hours a year of exposition to sunlight have been considered; this is the case in central Italy.

Furthermore, a yearly 0,05% decrease in the production of the photovoltaic plant has been considered. This is due to a normal depletion of the materials. The MiSE incentive and the ARERA incentive are described within the current legal framework, respectively 110 €/MWh and 9 €/MWh. For what attains the price of the electrical energy, 60 €/MWh has been considered. This is the average price recorded in 2019 (Gestore Mercati Energetici, 2020) before the outbreak of Covid-19 and the Russia-Ukraine conflict. Currently, the price is much higher, but it is due to external factors that will not be considered constant. Furthermore, using the current price of electrical energy would risk excessively inflating the numbers. Within this configuration, 10% of the revenues deriving from the shared energy are distributed to the energy community's members. In this particular case, the yearly profits go to the plant owner. The plant price considered is 1000 €/kW, making the total cost of the plant 200.000 €. Finally, in this case, the owner of the photovoltaic plant takes advantage of the "Ecobonus"; hence the plant owner must pay only 50% of the total price. In order to pay the remaining part (100.000 €), the owner asks for a loan with a fixed yearly interest rate of 7% that must be repaid in eight years. In this configuration, the energy community members relied on an energy player such as a utility company to purchase the technological equipment and measurement services. These types of services are beneficial for energy communities. Tracking real-time the energy consumption of members allows for more efficient consumption, maximizing the amount of shared energy, hence increasing profits. For example, those activities done during nighttime that consume electrical energy can be shifted during the daytime when the photovoltaic plant is producing energy. The energy player is also in charge of selecting the members, assuring a 90% of shared energy within the configuration.

The plant owner physically consumes 20% of the energy produced within this configuration. In this case, the plant owner is the subject who is physically attached to the plant. There are six members within this energy community, each consuming 30000 kWh in Fascia 1 and part of Fascia 2 of the total amount of energy fed into the grid (200.000 kW). For this reason, 90% of it, 180.000 kW, can be considered shared energy. The remaining 20.000 kW flows into the grid without being consumed by the energy community members. It is worth mentioning that only the energy considered as shared is remunerated with both the ARERA and the MiSE incentives in addition to the current price of electricity (PUN Zonale).

The energy community's costs are summarized in the following table. On the left column, the type of cost is specified; instead, on the right column, the total costs after twenty years are displayed. The time horizon selected is twenty years because, as we have previously seen, the incentives last for twenty years in the section dedicated to the Italian legal framework.

Costs (20 years)	
O&M	€ 30.000,00
Loan	€ 130.883,68
Administrative costs	€ 24.300,00
Market Actor's Fee	€ 33.500,00
Distribution of benefits to members	€ 64.440,00
Total	€ 283.123,68

Figure 6 Overview of the costs

Now let us consider the revenues. One part comes from the incentives for shared energy, the other from the sale of excess energy. The following table shows the total revenues after twenty years.

Revenues (20 years)	
Incentives	€ 644.400,00
Sale of excess energy	€ 22.863,41
Total	€ 667.263,41

Figure 7 Overview of the revenues

The following table summarizes total costs, revenues, and the gross margin after twenty years.

Economics (20 years)		
Total Revenues	€	667.263,41
Total Costs	€	283.123,68
Gross Margin	€	384.139,73

Figure 8 Overview of total costs, total revenues and gross margin

It is worth taking a deeper look at the trend gross margin within the twenty years. The graph below provides an overview.

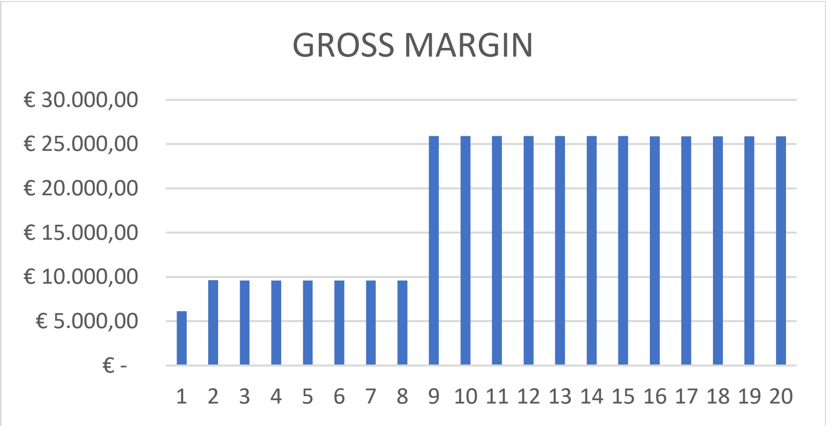

Figure 9 Overview of the gross margin across the selected period

As we can see, given the favorable incentive scheme, the energy community shows higher revenues compared to costs in its first year of life. The average gross margin across the twenty years is 19.206,99 €. It is worth mentioning that energy communities not only offer many advantages for the owner of the photovoltaic panel but also for the members. Given the price of electricity considered in the business model, thanks to the economic benefits distributed, the members will receive a 13% discount on their electric energy bill. In order to better understand the virtual approach used to calculate the amount of shared energy, it is worth saying that members continue to pay the total price of their energy bill and that the discount is represented by the yearly benefits they obtain from the energy community (Enel X, 2020).

Given the current legal framework, we can see that energy communities present very sound business plans, making them a profitable investment and a good target for the initiative presented in this thesis. Therefore, the following section will be dedicated to analyzing the market trends within the energy community sector to see whether there will be an expansion and whether it will be sufficient to make the project feasible.

6. Energy Communities: Future trends

For the proposed project to be feasible, Renewable Energy Communities need to grow in number. For this reason, this section is dedicated to analyzing different scenarios to understand the potential growth of Renewable Energy Communities. The analysis is based on the 2020 Energy Market Report of the Energy &

Strategy Group (the permanent observatory for strategy and innovation for the renewable energy sector). This report was used as a source of data because currently, it is the most detailed analysis of the expected growth of energy communities.

The report above mentions three penetration scenarios ("moderate," "intermediate," and "accelerated"), taking into account the economic sustainability of these initiatives for the users involved. The definition of the expected penetration scenarios for the configurations of self-consumers of renewable energy acting collectively and renewable energy communities are based on an estimate of the penetration rate of these initiatives on the total available market.

The methodological approach involves the analysis of historical data on the participation of users in self-consumption initiatives, with particular reference to the mechanism of the on-site exchange (scambio sul posto), concerning the economic viability of the same. The "Scambio sul Posto" service is a form of self-consumption that allows compensating for the electric energy produced and introduced into the grid in a specific moment with the one withdrawn and consumed in a different moment from the one in which the production takes place. In the "Scambio sul Posto" the electric system is used as an instrument for the virtual storage of the electric energy produced but not contextually self-consumed. A necessary condition for providing the service is the presence of plants for the consumption and production of electricity subtended to a single point of connection with the public network.

From the historical data of participation is derived an estimate of user participation in the new configurations of self-consumption of renewable energy acting collectively and renewable energy communities. The analysis of historical data is performed separately for residential and non-residential users, subdivided into the North, Central, and South geographic zones. The analysis was developed over a five-year time horizon (2015-2019). The selected period is 2015-2019 since the scambio sul posto initiative was borne in 2015.

It is beyond the scope of this thesis to discuss the methodology of this report, but it is crucial to discuss the results. The results related to the diffusion of Jointly acting renewable self-consumers will not be discussed since the focus of the thesis is on renewable energy communities. In the Moderate scenario in the 2021-2025 period, there will be 14000 to 15000 RECs. In the intermediate scenario, between 20000 and 21000 RECs. In the accelerated scenario, there will be from 29000 to 31000 RECs.

It is worth mentioning that the report did not consider the potential boost that the Italian National Recovery and Resiliency Plan can represent for the diffusion of Renewable Energy Communities (NRRP). This, of course, is because the NRRP was finalized in 2021, after the report's release date. The NRRP is divided into six main missions, and for each mission, there are sub-missions. More specifically, Mission number two is dedicated to promoting renewable energy sources, hydrogen, and sustainable mobility networks. Within mission number two, the first field of intervention is dedicated to increasing the share of energy produced from renewable energy sources. The plan allocates 5,9 billion euros for this area of intervention. Of these 5,9 billion euros, 2,2 billion are explicitly allocated to promote energy communities. It is also worth mentioning that the third field of intervention is dedicated to promoting the production, distribution, and uses of hydrogen. The plan allocates 3,19 billion euros for this field of intervention.

Given the considerable number of resources dedicated to promoting renewable energy sources and energy communities, it is reasonable to consider the accelerated scenario presented by the Energy & Strategy Group as a realistic one. Therefore, within this thesis, 30000 RECs by 2025 will be considered the potential market.

7. The Business Model: EnerLend's Way

As stated above, especially in the context of SMEs, renewable energy communities are seen more as a source of profit than a tool to deliver a positive impact for members and local communities. On average, photovoltaic panel owners usually share only 10% of the revenues generated from the shared energy.

For these reasons, the proposed project, EnerLend, aims to collect the profits of existing RECs and reinvest them to create new energy communities. On the one hand, such a project protects the interests of those SMEs who are more profit-oriented, guaranteeing a return on the investment. However, on the other hand, it assures that existing RECs are contributing to the generation of positive impacts. The following section is dedicated to outlining the business model of such an organization.

7.1 Creating a Network

In the section dedicated to analyzing the current trends in the renewable energy communities sector, the main actions to give birth to a REC have been outlined. The activities are divided into three dimensions, bureaucratic, technical, and economical. It is crucial to include two types of partners in the first place. The first one can manage all the bureaucratic activities necessary to establish the configuration with a more legal background. Instead, the second one must be capable of providing the energy community with the technical infrastructure, interesting partnerships here could also be built with universities interested in tech transfers. In the project's initial phase, particular attention should be paid to the economic activities necessary in the setup phase and, specifically, to the financing part. The organization will not have enough capital to set up an energy community in its early stage. For this reason, EnerLend can, initially, either include a financial institution in the network or search for investors. The second option would be the best considering that financial institutions are competitors. It is essential to mention that the relevance of a network and the idea of approaching RECs in their initial phase is because asking already established energy communities to manage their resources might face some resistance (Mori, 2022). The proposed network generates business opportunities for all the partners involved creating an incentive to enter.

7.2 Collecting Capital

Once the energy communities have been set up and have reached their payback time, EnerLend can start collecting profits of existing RECs. Again, this will be done on an online platform. EnerLend will retain a fee on the capital collected.

7.3 Investment phase

EnerLend can now start investing the collected capital in financing new energy communities. The benefits for the members of established energy communities are reflected in the interest rate on the investment. The following image summarizes the main steps envisaged in the business model.

Figure 10 EnerLend's main steps

The image below summarized EnerLend's business model underlining the revenue stream.

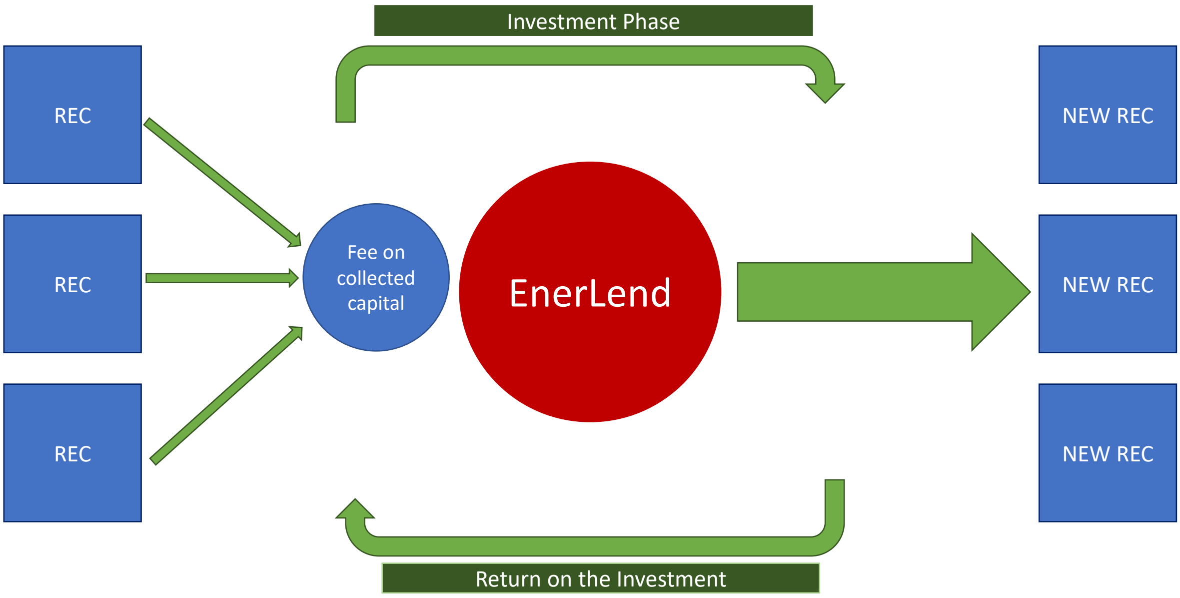

Figure 11 EnerLend's Business Model

7.4 The Added Value

The main competitors of EnerLend are other financial institutions, especially banks. The actors interested in creating an energy community could ask a bank for a loan. On the one hand, this is true and can potentially pose a threat to the proposed business. On the other hand, this solution has a more holistic approach. As was previously mentioned finding funding for an energy community is only one of the activities to create an energy community. Offering an integrated solution that also addresses the bureaucratic and technological dimensions reduces the burden on the customer.

Furthermore, EnerLend foresees solutions to increase the revenues of existing RECs, representing a further incentive for potential customers. It is also worth mentioning that banks still have not understood the potential of energy communities, and currently, there are not many offers dedicated to these configurations (Mori, 2022). This situation may lead to first-mover advantages. It is also worth mentioning that banks offer several services and have different investment strategies that focus on several financial instruments and sectors. Instead, EnerLend focuses only on energy communities, with a clear and distinctive investment strategy. This allows the proposed entity to be more recognizable on the market for the energy community sector.

7.5 SWOT Analysis

The strength of the project resides in the relatively simple business model. The investment strategy is clear and focuses on one main target. Furthermore, given the current incentive scheme RECs have excellent business plans that can assure a significant return on the investment. Another strength of the project is its scalability. EnerLend can change its targets and investment strategy, given the relatively simple business model. It could open up to investors other than RECs and find new investment opportunities other than renewable energy communities. Furthermore, the incentives a renewable energy community can receive last for twenty years. These characteristics assure a relatively secure supply of capital. It is also worth mentioning that the incentives energy communities receive, as we have seen, are fixed by law, drastically reducing uncertainty.

The main weakness of the project is the difficulty that may be encountered in building a network. In the first place, it might be difficult for potential partners to understand the benefits related to such an initiative entirely. Energy communities are a relatively young topic; hence there are still some issues regarding awareness. This might hinder the network-building process, which is fundamental to EnerLend. In the second place, building a network can result in a time-consuming activity that can reduce the competitive advantage of being a first-mover.

Despite this, several opportunities can contribute to the development of the project. In the first place, as we have previously discussed, the legislative framework. The latter contributes to the solidity of a REC's business plan. In the second place is the Italian National Recovery and Resiliency Plan. It allocates many resources to promote renewable energy sources and energy communities. This represents a massive opportunity for the energy community sector to grow hence contributing to the feasibility of EnerLend's business model. Finally, in the third place, renewable energy sources are rapidly climbing the EU's and Italy's agendas (European Commission, 2019; Ministero dell Sviluppo Economico, 2019). Several measures have been implemented, and others still have to be.

There is general momentum behind promoting renewable energy sources and energy communities, but there are still some threats. First of all, the RED II still has not been transposed into its definitive version. In particular, there might be a change in the value of the incentives. This, of course, can harm the project. In the second place, it is worth mentioning that EnerLend heavily relies on the expansion of energy communities. If the market is incapable of growing as expected, the project's success can be seriously threatened.

8. Defining the Legal Nature

This section will be dedicated to analyzing the legal nature of EnerLend. More specifically, it will be argued that the nature of lending crowdfunding platform is the most suited one. The first part of this section will define crowdfunding and crowdinvesting and describe the two crowdinvesting typologies, equity crowdfunding and lending crowdfunding. Instead, the next part will focus on lending crowdfunding platforms, briefly analyzing the regulatory framework and the central business models. Finally, the last part will show why the form of lending crowdfunding platform is well suited for the project and will give another overview of possible competitors and EnerLend's added value.

8.1 Crowdfunding and Crowdinvesting: Providing definitions

The European Commission provides the following definition of *crowdfunding*: "*c*rowdfunding is an emerging source of financing involving open calls to the public, generally via the internet, to finance projects through monetary contributions in exchange for a reward, product preordering, lending, or investment. For small businesses, access to this form of finance represents an alternative (or a complement) to more traditional sources of finance like debt finance". There are four models of Crowdfunding (Osservatori Entrepreneurship Finance & Innovation, 2021):

1. Donation-based crowdfunding: these are fundraising campaigns in which no particular reward is offered, other than thanks, and thus typically targeted at solidarity, culture, patronage, volunteerism, and sports objectives (Ibid);
2. Reward-based crowdfunding: in which case a reward of a nonmonetary nature, such as an object or service, is offered; often, the reward is the product itself that is to be realized through the funding request, and in this sense, the collection takes the form of a pre-sale (pre-selling) not very different from an e-commerce operation (Ibid).
3. Royalty-based crowdfunding: the reward, in this case, is monetary and consists of a share of the profits or revenues associated with the investment, but without any title to the project or repayment of capital (Ibid);

4. Crowdinvesting: in this case, the financing is made by way of investment, with a reward associated with it, which can take the form of underwriting venture capital (equity) or a loan (lending). Since investment is offered in such a case, the campaign must be carried out according to orthodox criteria defined by laws and supervisory authorities, which vary considerably from nation to nation.

Therefore, *crowdinvesting* can be defined as a subset of crowdfunding. Against the raising of financial resources by a company (or an individual) a return of capital is offered to the investor. A key element is the presence of an enabling platform that, through the internet, can connect enterprises and investors and finalize the investment. There are two types of corwdinvesting (Ibid):

1. Equity Crowdfunding: This form of crowdinvesting sells a stake in a business to a certain number of investors in return for investment. In this situation, the investor becomes a business partner (Ibid);
2. Lending Crowdfunding: The investment consists of granting a loan to an individual (consumer) or a business (business), with a loan agreement or a securities bond. The return on the investment is equal to the interest rate (Ibid).

8.2 Lending Crowdfunding vs. Equity Crowdfunding

The choice between equity and lending crowdfunding is mainly related to risks. Equity crowdfunding platforms present higher returns but at a higher risk. Investing in the shares of a start-up, for example, can provide higher returns in the long term, but on the other hand, if for some reason the start-up fails, there is the possibility of losing all the capital invested. On the other hand, lending crowdfunding presents fewer risks since the interest rate is fixed. Furthermore, there are more guarantees in this case since the financed asset can be used to repay the debt in case of default. Furthermore, the time to repay the debt can be fixed, assuring a safer investment.

8.2 Lending Crowdfunding Platforms: an overview

This section is dedicated to providing the reader with an overview of lending crowdfunding platforms touching upon the following aspects: the Italian normative framework, existing platforms, and the business models that have emerged in the Italian market. The last part of the section will be dedicated to analyzing the influence the choice of starting a lending crowdfunding business can have on the business model previously illustrated.

8.2.1 The Italian Regulatory Framework

The first lending crowdfunding operators in Italy were initially authorized to operate as financial intermediaries under Art. 106 of the Testo Unico Bancario by the Bank of Italy, but for some cases, it was not long before disputes emerged concerning operational activity (Osservatori Entrepreneurship Finance & Innovation, 2021). Subsequently, the entry into force of Decree-Law 11/2010, implementing the European Directive 2007/64/EC (Payment Service Directive), allowed the Bank of Italy to better define the regulatory framework by framing lending crowdfunding platforms as Payment Institutions (ex art. 114 septies of the Testo Unico Bancario, TUB) incentivizing the creation of a new category of operators, including from non-financial sectors, active in the execution of payment orders (Ibid).

Payment Institutions are required to comply with some of the provisions outlined in the Civil Code, the Testo Unico Bancario (TUB), Resolution 1058 of July 19, 2005 of the Interministerial Committee for Credit and Savings, and the General Supervisory Provisions for Payment Institutions issued by the Bank of Italy, concerning the company's minimum capital and regulatory capital, organizational structure (with first-, second- and third-tier controls), and the requirements of professionalism, integrity, and independence of directors and auditors (Ibid). The Bank of Italy constantly monitors these operators.

In November 2016, again, the Bank of Italy, after a year-long consultation-published a new measure (Resolution 584/2016, "Provision laying down provisions for the collection of savings by entities other than banks") aimed at providing an initial regulatory framework for alternative forms of financing to the traditional banking channel (Ibid). The document in Section IX explicitly identifies the chain of 'social lending' or lending-based crowdfunding, financed by a plurality of private lenders (small savers or institutional investors). The activity of the platform operator, the document specifies, is authorized if it can be framed as the provision of payment services (Ibid). In contrast, from the borrower's point of view, fundraising is authorized when borrowers and lenders can affect the contractual terms by asserting their bargaining power in a personalized negotiation (Ibid). However, the Supervisory Authority recommends that a maximum permissible limit be set in the investment on portals by individuals so as not to constitute the abusive exercise of banking (Ibid).

From a contractual point of view, the relationship between the lender and the financed party is configured under Articles 1813 et seq. of the Civil Code as a 'loan contract' by which one party makes sums of money available to the other with a promise by the latter to make a repayment within a certain period (ibid). The platform offers a 'remote' payment service contract that it signs with participants in the transaction (Ibid). The regulatory framework is expected to change since, on October 20, 2020, the EU Regulation 2020/1503 on European Business Crowdfunding Service Providers (ECSP) was published in the Official Journal of the European Union, introducing some novelties (Ibid). The central aspect to underline is that the regulation above establishes a common regulatory framework for equity and lending crowdfunding platforms (Ibid). The regulation introduces changes in the field of the licensing regime for platforms of rules of conduct, and, in addition, it allows cross-border operation of platforms in other European countries under a 'passporting' regime. An in-depth analysis of the regulation is beyond the scope of this thesis, considering that Italy still lacks a detailed regulatory framework for lending crowdfunding platforms (Michele Perrino, 2022).

8.2.2 A brief overview of existing platforms

As of June 30, 2021, 28 lending platforms were operational in the Italian market. Starting with those that lend to individuals (consumer lending), they are six as last year (Osservatori Entrepreneurship Finance & Innovation, 2021). When considering the ones that lend money to businesses (business lending), they are 22 compared to 11 surveyed a year ago. It is interesting to stress that there has been a high increase of platforms in the business lending sector. This is probably attributed to the general growth of the crowdinvesting sector and the increased availability of capital that has been recently registered (Ibid).

8.2.3 Existing Business Models

It is worth mentioning that not all of the platforms previously mentioned raise funds on the web (Osservatori Entrepreneurship Finance & Innovation, 2021). Moreover, some only leverage funds raised from professional investors, making it difficult to classify them within the crowdfunding world (Ibid).

As for the other platforms, it is correct to say that lenders from the internet have a direct claim on the financed entities (as opposed to savers who deposit their money with a bank that provides the credit). However, it is also true that lenders do not necessarily exercise the opportunity to choose ex-ante to whom they lend money (Ibid). There are two dominant models currently in the market, the 'diffuse' model and the 'direct' model (Ibid).

The diffuse model involves an active role of the platform in selecting credit applications from all those received and deciding on the allocation of the invested capital (Ibid). First, lenders make a certain amount of money available to the platform, providing specific indications concerning the predetermined amount, the expected interest rate, and the risk appetite, i.e., the risk-return profile deemed satisfactory. Then, the platform itself automatically allocates the money among the projects deemed eligible, according to the criteria given by the lenders. Given the flow of applications received through the web, the selection is typically made in two stages, the first based on standard criteria, the second by examining the specific situation, and consulting databases made available by providers (Ibid). Sometimes information about the applicant is also gathered through social networks and analysis of big data related to past payments, credit card transactions, and any other element deemed valuable in predicting creditworthiness.

Lenders do not necessarily choose and know ex-ante who the borrower will be (Ibid). However, they can know in the first instance the borrower's earning capacity and his or her main characteristics (age for individuals, residence, credit risk), and they will know in real-time whether the payments servicing the loan are regular or not. Once they become lenders, they can ask for detailed information (Ibid). Repayments of principal and interest paid each month are automatically reinvested unless the lender makes different arrangements (Ibid). In some cases, he or she may ask for influence in the choice of loans, depending on the profile chosen (Ibid).

The advantage of this model for the applicant is the certainty of having the funds available in a short time (Ibid). As soon as the request is accepted, the money gets deposited. Applicants receive a proposal from the platform concerning the expected interest rate, which includes the net remuneration for the lender, plus a margin for the platform and a second possible margin that goes to finance a security fund to protect against unreimbursed credits, where provided.

Instead, the direct model allows the web-connected investor to transparently view the applicant's identity and choose to whom they lend money, assessing the relationship between risk and the promised interest rate (Ibid). Unlike the previous model, the investment process begins with the applicants, who are subject to the platform's risk assessment (with criteria similar to those outlined above). The investors then choose whether and how much to invest in the different collection campaigns (Ibid). This model is closer to the crowdfunding paradigm but exposed to higher default risk (since the portfolio diversification effect is not automatic) and is time-consuming for the lender (Ibid). In this case, the platform's role consists only of pre-selecting projects that will be published and made accessible to investors.

Platforms active in Italy until 2016 applied the "diffused" model, which remains prevalent in the consumer world today.

8.2.4 How does the choice of being a Lending Crowdfunding Platform influence the Business Model?

Now that the nature of the proposed business has been made more precise, it is worth mentioning some aspects that can complete the business model outlined in the previous section.

8.2.4.1 Diffuse vs. Direct Model

First, it is crucial to mention that EnerLend will adopt a diffuse business model. This will reduce the exposure to default risk for the investor and the time required to perform an investment (Osservatori Entrepreneurship Finance & Innovation, 2021).

8.2.4.1 The Added Value: Facing other Lending Crowdfunding Platforms

In the section dedicated to the business model, mainstream financial institutions have been considered leading competitors. However, it is also necessary to consider existing lending crowdfunding platforms to understand better where the projects' added value resides. The leading competitor in this field is Ener2Crowd (Osservatori Entrepreneurship Finance & Innovation, 2021). This platform is specialized in green projects and sustainable investments (renewable energy production, industrial and residential energy efficiency, sustainable mobility, and projects with social impact). The platform was founded by two engineers, Niccolò Sovico and Sergio Pedolazzi, and officially launched in September 2019 (Ibid). It uses the 'direct' model, and Internet users can select their favorite projects. Through 6/30/2021, Ener2Crowd has funded 24 projects (Ibid).

The funding totaled €2,747,516,00, and there are 534 active lenders (Ibid). None of the funded projects were showing payment delays as of the date shown. Ener2Crowd has launched partnerships with Flowe (Medionalum group), NeN (A2A group), and Vezua; the Bank of Italy and BIS have also selected it for the G20 Techsprint project. In September, the first pilots of crowdfunding campaigns to engage local communities in financing large wind and photovoltaic plants started in partnership with major industry groups (Ibid). Despite Ener2Crowds's success, some aspects can still differentiate EnerLend and assure a good performance on the market.

In the first place, EnerLend will adopt a diffuse business model. The advantages of this type of business model have already been discussed previously. In the second place, the target market is different. Ener2Crowd targets online investors in general to finance green projects. EnerLend will specifically target Renewable Energy Communities and focus its investment strategy on financing new energy communities. EnerLend aims to establish its presence in the niche market of Renewable Energy Communities.

Furthermore, EnerLend partially addresses a typical problem of crowdinvesting platforms, the one informational asymmetry. Since the incentives for Renewable Energy Communities are fixed by law, it is easier to assess the risk of the investment. Lastly, it is worth mentioning that EnerLend goes beyond providing a financial service. An essential part of its business model is creating a multi-stakeholder network to support the birth and growth of renewable energy communities. This approach helps to engage with the customer early, building customer loyalty.

9. EnerLend's Business Plan

The following section is dedicated to analyzing the business plan of the proposed organization. The following table summarizes the assumptions made.

Assumptions	
Number of total RECs by 2025	30000
Currently Existing RECs	21
Additional Renewable Energy Communities per year	7495
EC - Cluster 1	45%
EC - Cluster 2	45%
EC - Cluster 3	10%
Total potential Customers by 2025	27000
Total potential Customers every year until 2025	6750
Market Share (Years 1-5)	16%
Market Share (Years 6-10)	19%
Market Share (Years 11-15)	22%
Market Share (Years 16-20)	25%
Average yearly GM of a REC (100kW)	7.615,34 €
Capital collected (years 1-5)	8.250.154,53 €
Capital collected (years 6-10)	9.766.673,30 €
Capital collected (years 11-10)	11.308.779,61 €
Capital collected (years 16-20)	12.850.885,92 €
Fee on collected capital	2,00%
Cost of perpetual licence and source code	90.000,00 €
Number of Employees	4
Average salary	2.500,00 €
Payment processing cost (% on transaction)	0,5%
Hosting Provider	480,00 €
Platform's maintanance costs	1.200,00 €

Figure 12 Assumptions made to develop EnerLend's business model

The number of renewable energy communities expected by 2025 is 30000. This assumption is based on the Energy & Strategy Group's Electricity Market Report 2021, which was analyzed in section number six. Given the lack of data on the annual growth rate of renewable energy communities, this was estimated by considering a constant growth from 2022 to 2025 (total amount of RECs/years). The additional yearly units were then considered the same for the following years. It must be said that this is an approximation, but due to the lack of data, it is a reasonable assumption.

We have previously analyzed existing RECs' main characteristics, and three main clusters emerged. Cluster 1, in which public bodies and third sector organizations have a pivotal role, cluster 2, in which the Energy Player has the leading role, and Cluster 3, where Private citizens carry out the main tasks for giving birth to a REC. As we have previously seen, Clusters 1 and 2 are the most widespread. For this reason, it was assumed that 45% of the total amounts of RECs belong to cluster 1. Another 45% to cluster two and the remaining 10% to cluster 3. Cluster 1 and Cluster 2 are the main target of this initiative since they are reasonably the most interested ones. Concerning cluster 1, public bodies and third-sector organizations are interested in financing new initiatives, especially if they positively impact the territory they are active in (Loteta, 2022). Instead, RECs belonging to cluster 2 are interested in at least two reasons. The first one is setting up a REC because it will allow them to generate profits and lower their energy bill (Ibid). The second one is that engaging with EnerLend can increase profits and the discount on their energy bills (Ibid). For these reasons, only the RECs belonging to clusters 1 or 2 are considered potential customers. The period considered for this business plan is 20 years. It was assumed that this EnerLend could actively engage with 16% of all the targeted RECs in the first five years. This percentage then grows up to 25% in the last five years.

The average size of a renewable energy community considered is 100 kW. Currently, the average size of a REC is 48 kW (Energy & Strategy Group, 2021). This size, though, is expected to grow because, as we have previously seen, it will soon be possible to give birth to RECs with a size of 1000 kW. For these reasons, 100 kW was considered the average size of the targeted energy communities. The average yearly gross margin of a 100 kW REC is € 7.615,34. The business plan for this type of REC will be found in the Annex.

In the table summarizing the assumptions, the collected capital can be visualized in light blue. The collected capital has been calculated by multiplying the average gross margin of the Targeted RECs and the number of RECs that become customers. The fee on the collected capital is 2%. The assumptions related to costs have been made considering the 2020 Crowdfunding Industry Report, which collects data from existing crowdfunding platforms across ten different European countries. The report was conducted by Lenderkit, a white-label crowdfunding software for regulated investment businesses worldwide. The costs are mainly related to the setup and maintenance of the platform. The cost of a perpetual license, including the source code, has been considered of € 90.000,00. The costs of the hosting provider have been considered of € 480,00 per year, and the platform maintenance costs € 1.200,00 per year. Furthermore, a 0,5% fee for each transaction has been considered for payment processing costs. Lastly, four employees have been considered each earning € 2.500,00 a month.

The total costs are summarized in the following table. On the left column, the type of cost is specified; instead, on the right column, the total costs after twenty years are displayed.

Costst (20 years)	
Perpetual licence and source code	90.000,00 €
Personnel	2.600.000,00 €
Payment processing costs	1.033.324,09 €
Hosting Provider	9.600,00 €
Platform Maintaianance costs	24.000,00 €
TOTAL	3.756.924,09 €

Figure 13 Overview of the costs

The total revenues are summarized in the following table. On the left column, the type of revenues is specified; instead, on the right column, the total revenues after twenty years are displayed.

Revenues (20 Yyears)	
Collected Fee	4.217.649,34 €
TOTAL	4.217.649,34 €

Figure 14 Overview of the revenues

The following table summarizes total costs, revenues, and the gross margin after twenty years.

Economics (20 years)	
Total Costs	3.756.924,09 €
Total Revenues	4.217.649,34 €
GROSS MARGIN	460.725,25 €

Figure 15 Overview of the total costs, total revenues and gross margin

Instead, the following graph provides an overview of the gross margin across the twenty years considered.

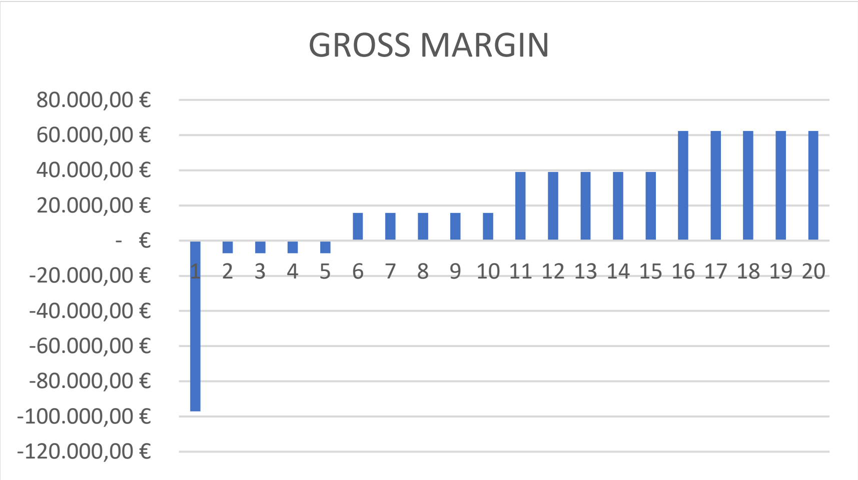

Figure 16 Overview of the gross margin across the selected period

As we can see from the graph, the company will start to register profits starting from the sixth year and recover from all the costs in twelve years. This data aligns with current market trends; in fact, crowdinvesting platforms usually have long payback times (Osservatori Entrepreneurship Finance & Innovation, 2021). It is also worth reminding that the chosen fee on the collected capital is very competitive, considering that the latter ranges from 2% to 10% when considering crowdinvesting platforms (Ibid).

10. Measuring EnerLend's Impact

The following section will be dedicated to analyzing the possible positive impacts generated by EnerLend. The selected dimensions to measure the impact are number of RECs financed, environmental benefits, and socio-economic benefits.

10.1 New RECs Financed

Considering that EnerLend's primary mission is to promote the diffusion of Renewable Energy Communities, an indicator that can be considered to assess the impact is the number of Renewable Energy Communities financed. For calculating this, the yearly amount of collected capital was divided by the cost of a 100 kW photovoltaic plant. In this analysis, the access to the 50% deduction was considered. It is a reasonable assumption because this measure will stay in place until 2024. In addition, as we have previously seen, the NRRP foresees new incentives for renewable energy sources making the assumption realistic. The following table displays the results.

New RECs Financed	
Capital collected (years 1-5)	8.250.154,53 €
Capital collected (years 6-10)	9.766.673,30 €
Capital collected (years 11-10)	11.308.779,61 €
Capital collected (years 16-20)	12.850.885,92 €
RECs financed each year - considering 50% deduction (years 1-5)	138
RECs financed each year - considering 50% deduction (years 6-10)	163
RECs financed each year - considering 50% deduction (years 11-15)	188
RECs financed each year - considering 50% deduction (years 16-20)	214

Figure 17 New renewable energy communities financed

10.2 Environmental Benefits

In order to assess the environmental benefits, the reduction of CO2 will be considered. This indicator has been selected because CO2 is the leading cause of climate change, and it primarily originates from the production of electric and thermal energy (Beylot et al., 2019). For calculating the reduction of CO2, it was necessary to understand how much CO2 is generated on average for every kWh. In order to asses this ENEA's report "La Comunità energetica - Vademecum 2021" was used. According to the studies carried out by ENEA, it can be said that, on average, the consumption of 1kWh generates 0,3524 equivalent Kg of CO2 (Cappellaro et al., 2020). For this reason, to calculate the reduction of CO2, the amount of shared energy plus the amount of physically consumed energy of the targeted RECs has been considered. This number has then been multiplied by 0,352 equivalent Kg of CO2 and by the number of new RECs financed in a year by EnerLend. This calculation was repeated and summed across all the twenty years considered in the business plan. Finally, the total amount of CO2 was divided by twenty to assess the average yearly CO2 reduction. The following table displays the results.

CO2 Reduction		
CO2 Emitted every 1 kWh	0,352	Kg/CO2e
RECs financed each year - considering 50% deduction (years 1-5)	138	
RECs financed each year - considering 50% deduction (years 6-10)	163	
RECs financed each year - considering 50% deduction (years 11-15)	188	
RECs financed each year - considering 50% deduction (years 16-20)	214	
CO2 Saved (Years 1-5)	6057	Ton/CO2e
CO2 Saved (Years 6-10)	25813	Ton/CO2e
CO2 Saved (Years 11-15)	29889	Ton/CO2e
CO2 Saved (Years 16-20)	33965	Ton/CO2e
Average CO2 Saved Yearly	4786	Ton/CO2e

Figure 18 CO2 Reduction

10.3 Socio-Economic Benefits

In order to assess the socio-economic impacts, the average yearly amount of economic benefits distributed to members of RECs has been considered. Furthermore, the average discount on the energy bill for both an SME and a household has been considered. In order to calculate the average yearly amount of economic benefits distributed to members of RECs, it was estimated that 10% of the revenues generated by a 100 kW REC (the target REC) are distributed to the members. The average yearly amount of benefits was then multiplied by the number of RECs financed in a year by EnerLend. This calculation was repeated and summed across all the twenty years considered in the business plan. The total amount of benefits distributed was then divided by twenty to assess the average yearly benefits. Next, let us calculate the average discount on the energy bill for both SMEs and households. Considering the number of members present in a REC composed of SMEs and one composed of households, the annual economic benefits were divided by the number of members to estimate each member's economic benefit. The following reasoning was made to calculate the cost of an energy bill for an SME and a household. Considering that a household consumes, on average 2700 kWh (Cappellaro et al., 2020) and an SME 70000 kWh (LEAPS4SME, 2021), these numbers were multiplied by the price of energy pre-Covid 19 and before the Ukraine-Russia conflict. The price considered was 60 €/MWh. Each member's benefit received was then divided by the cost of the energy bill to quantify the discount. The following table summarizes the results.

Distributed Benefits	
Yearly average benefits distributed to members	283.109,71 €
Average discount on energy bill for a family	11%
Average discount on energy bill for an SME	13%

Figure 19 Average yearly benefits distributed and % discount on the energy bill

11. What if? Quantifying the Risks

As we have seen, the project's feasibility relies on three main external factors. In the first place, the expansion of renewable energy communities since the latter represents the potential market. In the second place on the incentives received by energy communities, EnerLend's revenues derive from the collected capital. Therefore, a decrease in the value of the incentives would cause a reduction in collected capital, and lastly, the incentives for purchasing photovoltaic panels since these determine the number of renewable energy communities that can be financed.

Let us start by analyzing the effects of different renewable energy community expansion scenarios. As was previously stated in section six, the 2020 Energy Market Report of the Energy & Strategy Group (the permanent observatory for strategy and innovation for the renewable energy sector) has foreseen three penetration scenarios: moderate, intermediate, and accelerated. The accelerated scenario was used to discuss EnerLend's business plan, but now the effect of the intermediate and moderate scenario on EnerLend's business plan will be discussed. The moderate scenario foresees 15000 renewable energy communities, while the intermediate scenario foresees 20000 renewable energy communities by 2025. To assess the effect of these two scenarios on EnerLend's business plan, all the other assumptions were left unchanged except the number of renewable energy communities that will be present by 2025. The following graph compares the gross margin of the moderate, intermediate, and accelerated scenarios.

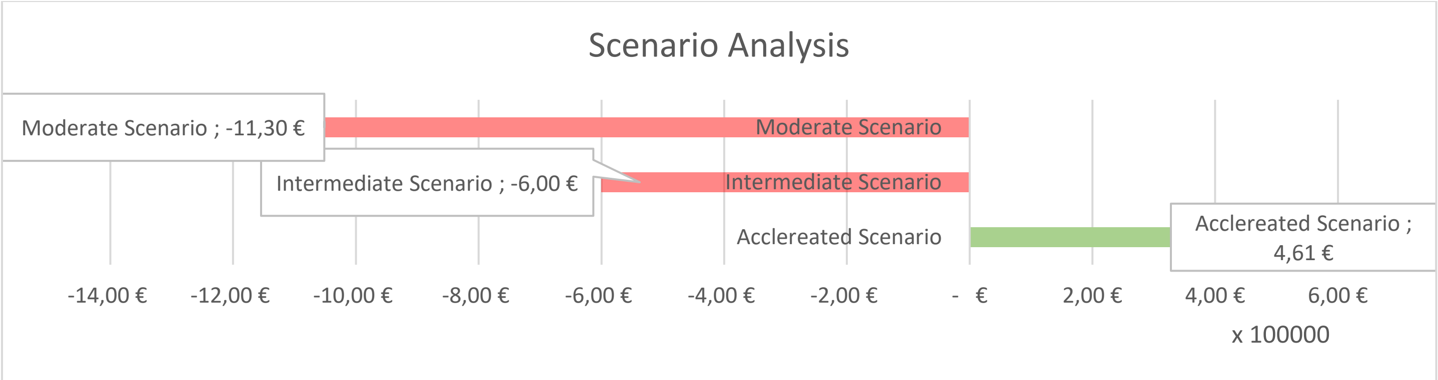

Figure 20 The impact of different expansion scenarios

As we can see from the graph, the expansion of renewable energy communities significantly affects EnerLend's business plan. If either the moderate or intermediate scenario turns out to be accurate, EnerLend's business plan will be severely harmed. It would not be feasible to consider renewable energy communities as the only investors in both cases.

Let us now consider the effects on EnerLend's business plan if renewable energy communities received lower incentives than the ones they currently receive. Once again, all the assumptions were kept unchanged the only thing that changed was the incentives. For what attains the MISE incentive, it was lowered to 90 €/MWh compared to the current 110 €/MWh, and the ARERA incentive was lowered to 7 €/MWh compared to the current 9 €/MWh. The following graph shows the effects of this scenario on EnerLend's business plan compared to the scenario presented in section nine.

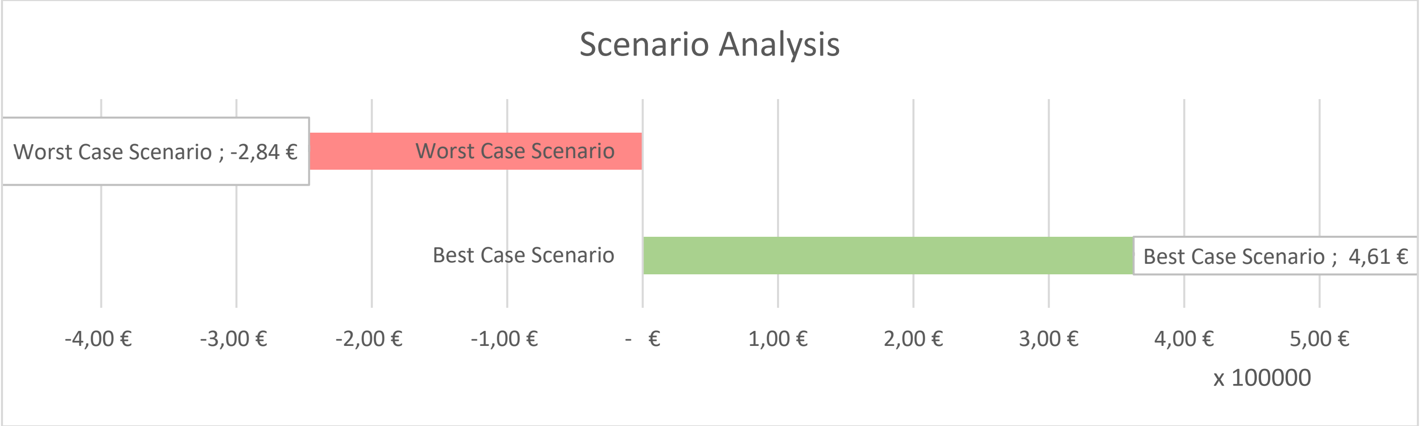

Figure 21 The Impact of different incentive schemes for renewable energy communities

As we can see from the graph, within the twenty years considered in the business plan, the gross margin displayed has a negative value in the worst-case scenario. Despite this, it is worth taking a closer look at the evolution of the gross margin during the period considered. The following graph compares the evolution of the gross margin both in the best and worst-case scenarios.

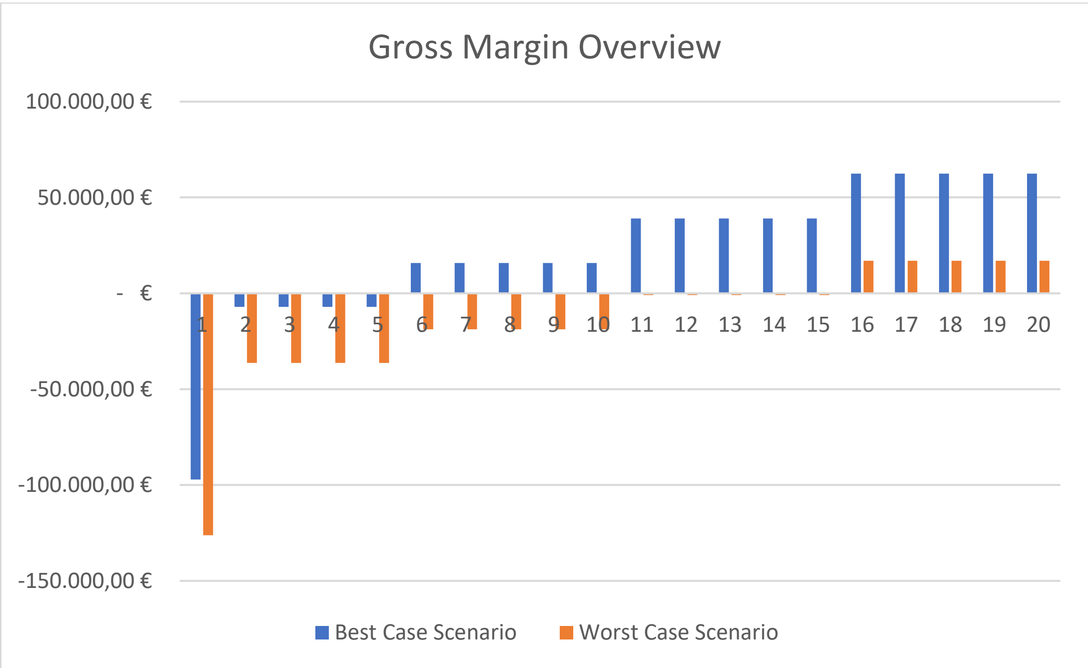

Figure 22 Overview of the gross margin across the selected period in both the best and worst-case scenario

When looking at the gross margin, we can see that EnerLend will start to register profits in the worst-case scenario, but in the sixteenth year, this will cause a longer payback time.

Let us now consider the effects of the incentive scheme for purchasing photovoltaic panels. An intermediate and a worst-case scenario have been elaborated. As we have previously seen, the "ecobonus" will stay in place until 2024. In this analysis, the new incentives will cover 25% of the expenditure in the intermediate scenario and, in the worst-case scenario, 0%. All the conditions are left unchanged. Of course, it is reasonable to assume that a change in the incentives for purchasing photovoltaic panels will also influence the expansion of energy communities. However, we have already seen the consequences of this phenomenon previously. Considering that the revenues generated by EnerLend derive from a fee on the collected capital, a change in the incentive scheme would influence the number of initiatives financed, hence the impact. However, this is true only if all the other conditions remain unchanged. The following tables show the results of this scenario.

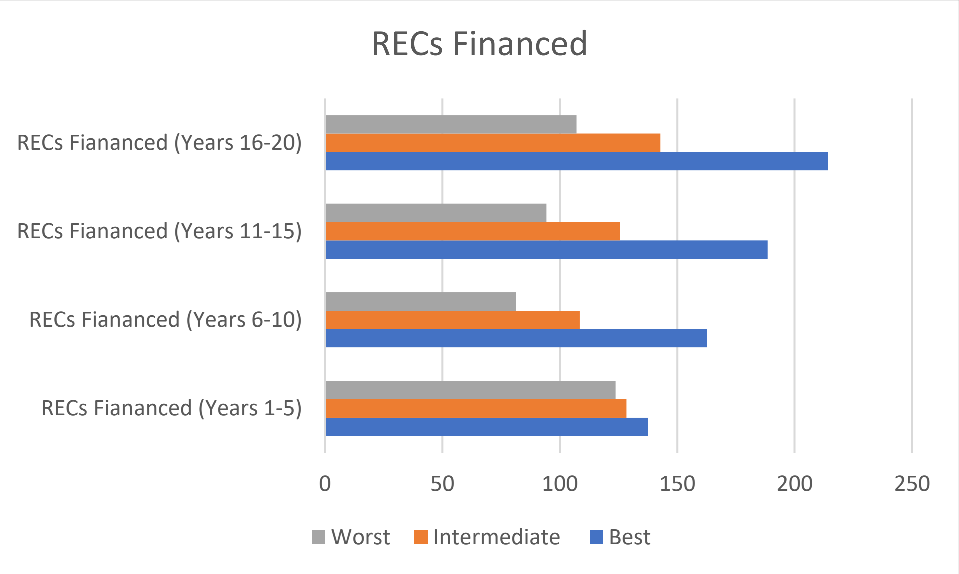

Figure 23 Number of RECs finance in worst, intermediate and best-case scenarios

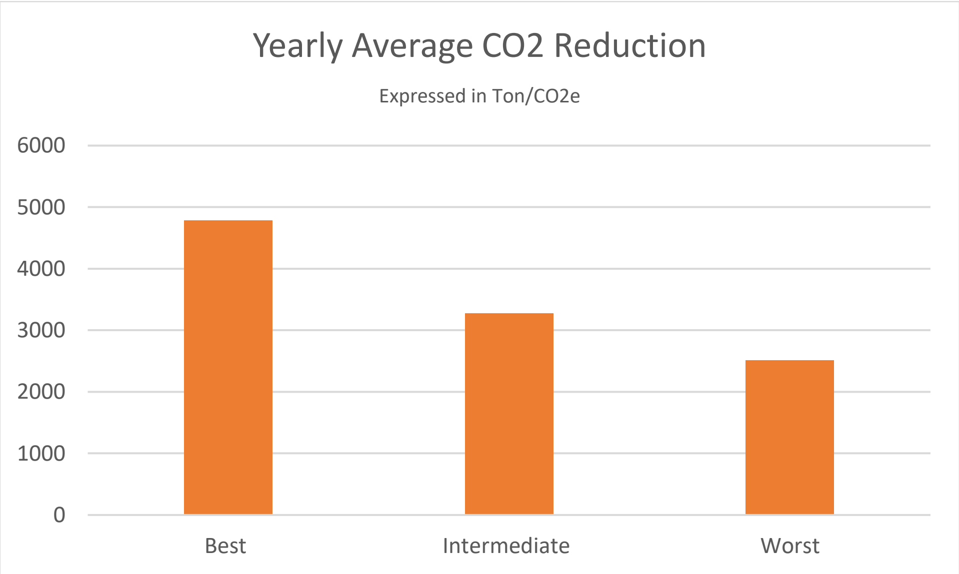

Figure 24 Average yearly CO2 reduction in the worst, intermediate and best-case scenario

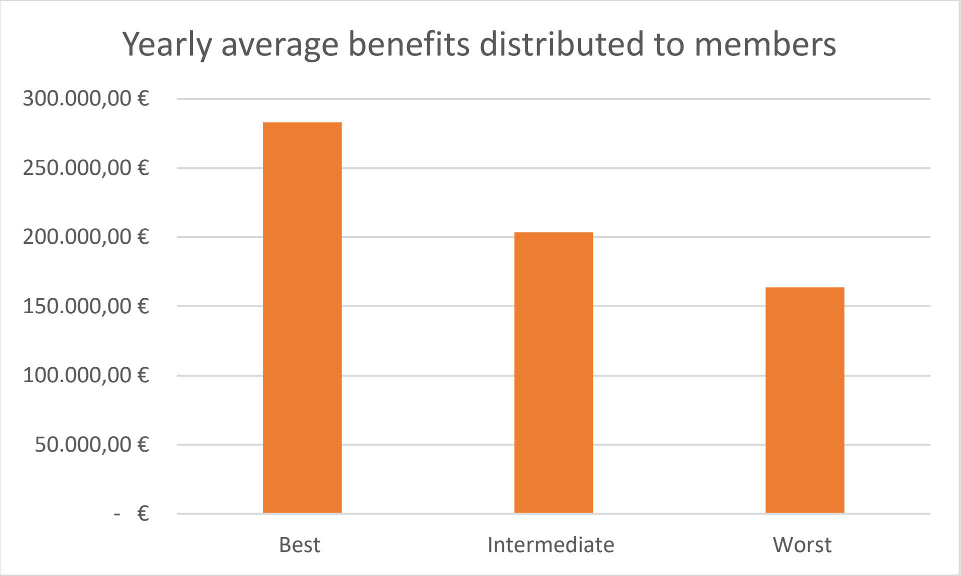

Figure 25 Yearly average benefits distributed in the worst, intermediate and best-case scenarios

As we can see, the incentive scheme for purchasing photovoltaic panels affects the possibility of financing new RECs, hence reducing the impact. The "ecobonus" can be a powerful tool to promote renewable energy sources. It will be interesting to see what will happen after 2024 in terms o policies for the promotion of RESs.

12. Conclusions and Future Research

At the end of this analysis, we can conclude that it is feasible to create a legal entity that collects capital generated from the profits of existing energy communities in order to finance new ones while at the same time protecting the interests of existing members. Furthermore, the adequate legal entity has been individuated. Nevertheless, some limitations must be taken into account. In the first place, to carry out the feasibility analysis, some assumptions had to be made, and in some cases, there was no extensive data. In the second place, as we have previously seen, the new incentive scheme to put the transposition of the RED II directive into practice is still not ready. A change in the incentive scheme might alter the business plan of EnerLend, making it either less sustainable or unsustainable from an economic perspective. In the third place, this project heavily relies on expanding energy communities. Despite all the positive signals, we cannot take for granted that this expansion will happen. If energy communities do not reach a significant number of units, EnerLend's target market will not be economically sustainable. In the fourth place, within the business plan, it has been considered that actors interested in giving birth to an energy community will have access to the 50% deduction to purchase photovoltaic panels. This measure will stay in place until the end of 2024, but it is interesting to see whether future incentives, like the 50% deduction, will be so advantageous. Lastly, the regulation for crowdfunding platforms is expected to change, especially in Italy, where this phenomenon is still not adequately regulated (Michele Perrino, 2022). Changes within the regulatory framework might make it less accessible to set up a business in the crowdfunding sector and impose stricter regulations.

This project has touched upon some issues that could inspire future research. As we have previously seen, energy communities are expected to proliferate. For this reason, as Gjorgievski et al. has pointed out, further research must be done on the conflicting interests of different actors that may arise. In addition, the diffusion of energy communities can impose costs on other actors, such as DSOs (Gjorgievski et al., 2021). Further research must be done to ensure that the diffusion of energy communities does not only benefit members. Another aspect that is worth considering is the diffusion of renewable energy sources. As we have seen in the reports published by the Energy & Strategy group, photovoltaic solar energy is the most diffused. It will be interesting to see how the diffusion of other renewable energy sources will influence energy communities. Connected to this issue is also the study on the best mixture of renewable energy sources to assure constant production. This is especially important for Italy where the most diffuse RES is photovoltaic which of course is not capable of producing energy at nighttime. Lastly, it will be interesting to study how the business plans of energy communities will change once they stop receiving incentives.

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Annex

The Annex is dedicated to outlining the business plan of two RECs powered by a 100 kW photovoltaic plant (the target RECs). The only difference between the two business plans is that the members are SMEs in one REC, and in the other, the members are households instead. This, of course, changes the number of members given the different electrical consumptions.

The reasoning and the calculations performed are the same in section five, in which a REC powered by a 200 kW photovoltaic plant was considered. For this reason, the assumptions made, the total costs, the total revenues, the gross margin, and the benefits distributed will be directly displayed. For simplicity, the business plan referring to the REC composed by SMEs will be defined as Business Plan 1. The REC composed of households instead will be defined as Business Plan 2.

The following table displays the assumptions made for Business Plan 1

Assumptions		
Members	3	
Sunlight Exposure	1250	Hours
Plant Size	100	kWp
Cost per kWp	1200	€
% of efficiency reduction of thr plant	0,05%	
Shared energy per member	30000	kWh
MITE Incentive	110	€/MWh
Price of Energy	60	€/MWh
ARERA Incentive	9	€/MWh
Economic Benefits distributed	10%	
% of physically consumed energy	20%	
Annual interest rate	7,5%	
Years to repay the loan	7,00	
% of shared energy	90%	

Figure 1 Assumptions made to develop the business plan

The following table displays the total costs considered in Business Plan 1

Costs (20 years)	
O&M	€ 24.000,00
Loan	€ 77.304,91
Administrative costs	€ 16.800,00
Market Actor's Fee	€ 31.000,00
Distribution of benefits to members	€ 32.220,00
Total	€ 181.324,91

Figure 26 Overview of the costs

The following table displays the total revenues considered in Business Plan 1

Revenues (20 years)	
Incentives	€ 322.200,00
Sale of excess energy	€ 11.431,71
Total	€ 333.631,71

Figure 2 Overview of the revenues

The following table displays the total gross margin of Business Plan 1, while the graph offers an overview of the gross margin across the years.

Economics (20 years)		
Total Revenues	€	333.631,71
Total Costs	€	181.324,91
Gross Margin	€	152.306,80

Figure 3 Overview of total costs, total revenues and gross margin

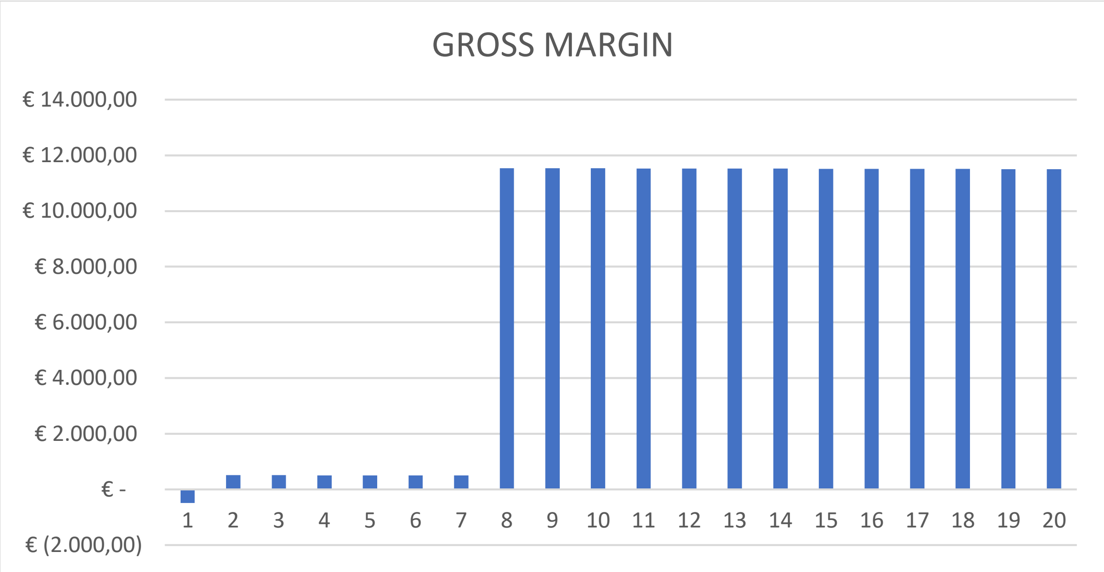

Figure 4 Overview of the gross margin in the selected period

The following table shows the economic benefits received by each member and the discount on the energy bill considering Business Plan 1

Benefits Distributed (yearly)		
Average Benefit per Member	€	537,00
Effect on energy bill		13%

Figure 5 Yearly benefits distributed to each member and % discount on the energy bill

The following table displays the assumptions made for Business Plan 2

Assumptions		
Members	90	
Sunlight Exposure	1250	Hours
Plant Size	100	kWp
Cost per kWp	1200	€
% of efficiency reduction of thr plant	0,05%	
Shared energy per member	1000	kWh
MITE Incentive	110	€/MWh
Price of Energy	60	€/MWh
ARERA Incentive	9	€/MWh
Economic Benefits distributed	10%	
% of physically consumed energy	20%	
Annual interest rate	7,5%	
Years to repay the loan	7,00	
% of shared energy	90%	

Figure 6 Assumption made to develop the business plan

The following table displays the total costs considered in Business Plan 2

Costs (20 years)	
O&M	€ 24.000,00
Loan	€ 77.304,91
Administrative costs	€ 16.800,00
Market Actor's Fee	€ 31.000,00
Distribution of benefits to members	€ 32.220,00
Total	€ 181.324,91

Figure 7 Overview of the costs

The following table displays the total revenues considered in Business Plan 2

Revenues (20 years)	
Incentives	€ 322.200,00
Sale of excess energy	€ 11.431,71
Total	€ 333.631,71

Figure 8 Overview of the revenues

The following table displays the total gross margin of Business Plan 2, while the graph offers an overview of the gross margin across the years.

Economics (20 years)	
Total Revenues	€ 333.631,71
Total Costs	€ 181.324,91
Gross Margin	€ 152.306,80

Figure 9 Overview of total costs, total revenues and gross margin

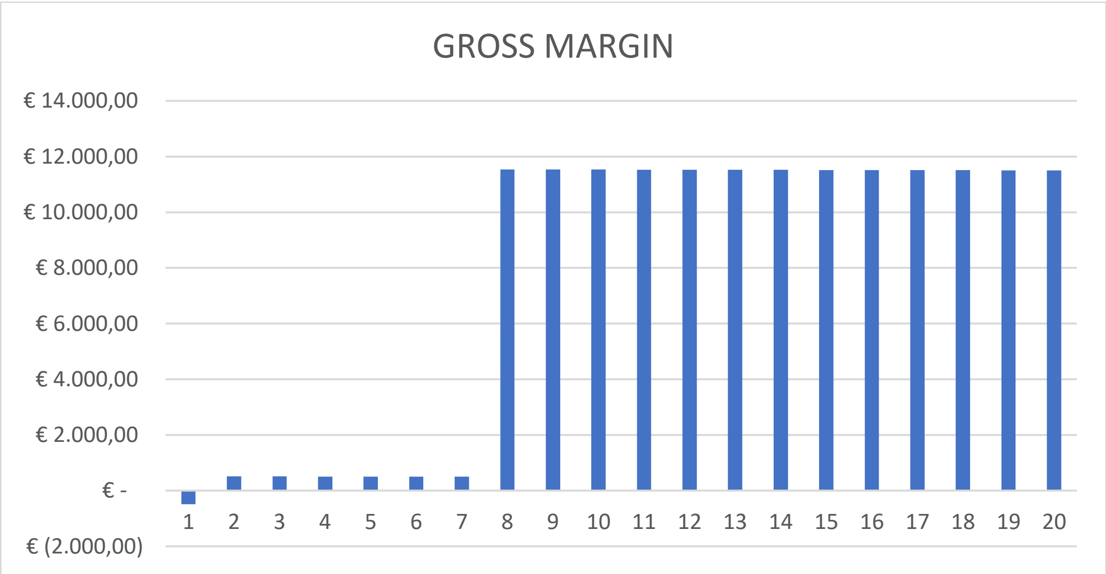

Figure 10 Overview of the gross margin over the selected period

The following table shows the economic benefits received by each member and the discount on the energy bill considering Business Plan 2

Benefits Distributed (yearly)	
Average Benefit per Member	€ 17,90
Effect on energy bill	11%

Figure 11 Yearly benefits distributed to each member and % discount on the energy bill

As we can see, the economic indicators are the same because 90% of shared energy is considered in both cases. What is different is the economic benefit received by the members. For example, in Business Plan 2, we can see more members than in Business Plan 1. This is because more members are needed to reach 90% of shared energy since households consume less energy than SMEs.

Summary

Energy communities represent a vital tool for the green transition; they promote the diffusion of clean energy while at the same time putting citizens at the forefront (Lowitzsch et al., 2020). Furthermore, given the direct involvement of citizens and local actors, they contribute to increasing the acceptance of renewable energy projects while at the same time mobilizing private investments in the field of renewable energy. Furthermore, they provide direct benefits to the citizens by promoting energy efficiency and lowering the price of energy bills.

Member states have implemented several support schemes to support energy communities across Europe, such as tax breaks, subsidies, tax incentives, social tariffs, and feed-in tariffs (Lode et al., 2022). For these reasons, energy communities can be seen as an exciting business opportunity (Ibid). This is particularly true in Italy, where an advantageous incentive scheme has been implemented.

On the one hand, energy communities represent a profitable business opportunity; on the other hand, by law, their primary purpose is to deliver environmental, economic, and social benefits for their members and community. Even though they can generate profits and their primary objective is to provide a positive impact on the local community, there is sometimes a loss of social value. This is especially true if we consider energy communities of which SMEs are members. In this situation, who indeed profits is the plant owner, who on average shares only 10% of the revenues generated with its members. These economic benefits, of course, represent a discount on the energy bill, thus causing a positive impact for the members. However, at the same time, the profits of the plant owner are usually not reinvested. Even if this is the case, there is limited impact.

For this reason, the thesis is dedicated to analyzing the feasibility of giving birth to a legal entity that can collect capital from existing energy communities to finance new energy communities. On the one hand, such a project can contribute to the promotion of energy communities; on the other, it can increase revenues of existing energy communities, increasing the economic benefits shared among their members.

Aim and Research Questions

This research aims to answer the following research question:

- *Is it feasible to create a legal entity that collects capital generated from the revenues of existing energy communities to finance new ones while at the same time protecting the interests of existing members?*

To answer the previous question, the following sub-questions must be addressed

- *Are Energy Communities capable of generating enough revenues?*.
- *Will there be enough energy communities in the forthcoming years?*
- *Is the business model sustainable?*
- *Which and why would be the most suitable legal entity for the organization?*

Scientific and Social Relevance

The research is scientifically relevant because it contributes to the existing literature in the following ways. First, energy communities are still relatively young entities, and second, not all the member states have implemented the necessary directives to enable energy communities. Research has mainly focused on four areas (Lode et al., 2022). The first one is related to the motivations to set up and join an energy community. The second one deals with the social acceptance of ECs and the technological assets installed in the ECs. The third, instead, focuses on the actors necessary to start up ECs. In contrast, the last cluster focuses on dedicated collaboration on the transition between actors, sectors, and systems (Ibid). Despite these attempts, there are still some research gaps that must be filled. In particular, Gjorgievski et al. have identified four main aspects on which there is still much work to do.

In the first place, further research should be done to analyze the most efficient ways to avoid drop-outs among the members of energy communities (Gjorgievski et al., 2021). In the second place, current literature has made it clear that there are several benefits for the members of energy communities, but if we take a broader look, there is the risk of imposing costs on other actors such as DSOs (Ibid). Further research must be done on this topic to ensure that the diffusion of energy communities can generate added value for all the actors involved. In the third place, there is a need for a common framework for trade-off analysis. There are several indicators to measure the positive social impacts of energy communities, but there is still much work to be done. Lastly, further research is necessary to analyze the evolution of investment opportunities and interests over time. Most studies consider the procurement of energy infrastructure as a single-stage event (Ibid). "However, experience shows that it is more common for energy communities to spread out their investments over time, based on annual savings, the development of local financial opportunities, and the interests of the community" (Ibid). Usually, these temporal dynamics are not taken into account.

Drawing upon the research gaps highlighted by Gjorgievski et al., this thesis tries to address the last aspect, focusing on the financial opportunities that energy communities can create, in the long run, for both members and society in a broader sense.

Aside from its scientific relevance, this research also has high social relevance. Energy Communities can drastically change the logic of energy distribution. We are assisting a shift from a centralized and hierarchical distribution system to a more decentralized and democratic one (Klagge & Meister, 2018). Energy communities challenge the mainstream capitalistic approach because they put people's environmental, social, and economic benefits at the forefront in the commercialization phase (Ibid).

Energy communities affect the local economy and energy system, the energy transition's social acceptance, and energy-related behaviors (European University Institute. Robert Schuman Centre for Advanced Studies., 2020).

Energy community projects are often related to increasing local jobs and economic development (Ibid). Traditional incumbents are more likely to rely on internal know-how to develop renewable energy projects (Ibid). Instead, community-based energy projects tend to rely on local suppliers and technicians to compensate for the internal lack of skills (Ibid). Local benefits of these projects can be seen in the return of investments for members, job creation, and redistribution of revenues (Ibid). This is especially true for energy communities, which according to the European legal framework, are obliged to consider the economic, environmental, and social benefit for the community over financial profit. The development of energy communities also affects the energy system as such. Community-based energy projects push towards a more decentralized energy system (McKenna, 2018), leading to a more secure energy supply that gradually relies less on the central grid.

Furthermore, several studies have shown a positive correlation between community-based renewable energy projects and increased social acceptance of renewable energy sources (European University Institute. Robert Schuman Centre for Advanced Studies., 2020).

Lastly, some studies have shown that participation in community-based renewable energy projects is positively correlated with more energy-efficient behaviors (Ibid). Furthermore, according to Berka and Creamer (2018), there is considerable evidence that active participation in community-based renewable energy projects leads to acquiring knowledge and skills across different sectors, such as energy technologies, project management, communication, business development, finance, and law.

With this being said, it is helpful to recall what Berka and Creamer (2018) have argued. More specifically, the positive societal impacts generated by energy communities vary across case studies and cannot always be taken for granted (Berka & Creamer, 2018). As stated above, especially in the context of SMEs, energy communities are seen more as a source of profit rather than an opportunity to generate a genuine impact on the territory. For this reason, the project proposed within this thesis is relevant from a societal point of view.

Methodology

The information provided in this thesis will be mainly obtained through desk research, sensitivity analysis, and Interviews. When explaining energy communities, reference will be made to multi-disciplinary literature deriving from different fields. As we will see later on, the diffusion of energy communities impacts various areas, technological, social, economic, environmental, and political (Gui & MacGill, 2018). Hence, a multi-disciplinary approach is necessary. Instead, references to legal aspects will stem from doctrinal research and scientific literature from the legal field and primary sources. Connection to primary resources is fundamental when discussing energy communities, especially in Italy, where all the regulations on the issue explicitly reference definitions provided by EU legislation. Instead, reference to doctrinal research and scientific literature from the legal field is necessary to provide adequate information on the measures adopted to promote renewable energy sources and the promotion of energy communities. Especially in Italy, as we will see, these kinds of policies have not followed an autonomous path but instead have responded to external commitments, resulting in a fragmented approach. Therefore, it is essential to rely on the legal field’s doctrinal research and scientific literature to reconstruct the primary measures. To describe the projects’ feasibility, sensitivity analyses, interviews, and desk research will be carried out. Desk research and interviews will be done to justify and verify assumptions. Once the assumptions have been verified and justified, sensitivity analysis will be carried out. Thanks to this kind of analysis, it is possible to verify and quantify the impact of a variable, which is considered independent, on a dependent variable given a set of assumptions (Christopher Frey & Patil, 2002). This kind of analysis is helpful because it can quantify the impact of those factors that can be considered a threat to the project. Reference to doctrinal research and scientific literature from the legal field will be made to verify the most suitable legal entity for the organization.

Structure

The thesis is structured in twelve sections. The first section introduces the topic of energy communities, stresses the scientific and societal relevance of the research, and describes the methodology.

Section two defines energy communities and how these entities operate. Energy communities can be defined as the result of a transition process from a centralized energy system to a democratic and decentralized one. Where energy is no longer seen as a private commodity delivered through the public grid but as a co-owned (Iaione, 2015), co-managed (Foster & Iaione, 2016), and co-produced common good (Wolsink, 2020). A system that goes beyond the individual prosumership but considers active citizens willing to take part in the energy system while at the same time generating a positive impact for their communities. For this reason, energy communities are also seen as a powerful means to achieve a more just and inclusive energy transition while at the same time giving citizens a central role (Hanke et al., 2021). To summarize, we can say that energy communities are entities that aim to promote the use of renewable sources on a local level, foster innovation, and growth of regional economies, and involve citizens in the management of resources.

Section three instead will provide an overview of the EU's and Italy's central policies to promote the use of renewable energy sources. This section must provide the reader with the necessary concepts that will be operationalized. The main focus will be on outlining the main features of the RED II Directive and the IEM Directive. The former aims to increase the share of energy produced from renewable sources in the European Union and increase public involvement in new renewable energy projects (Maps Group, 2021). Within this Directive, "Renewable Energy Communities" (RECs) and "jointly-acting renewable self-consumers" have been defined. The latter, instead, aims to adapt the EU electricity market to the technological and structural changes taking place in recent years (Ibid). Within this Directive, the definition of "CEC" Citizen Energy Community and "jointly-acting active customer" is provided.

Section four will describe current trends in the energy communities' sector, focusing on the technological setup, promoter(s), nature of the players involved, value proposition, financing methods, and mechanisms for distributing economic benefits among members.

Section five is dedicated to analyzing the business plan of a renewable energy community. The scope of this analysis is to understand and estimate the potential revenues and costs of an energy community. Such analysis is essential to understand whether energy communities can generate enough profit to be reinvested.

Once this analysis has been conducted, trends within the energy community market are presented to estimate the expansion of energy communities. This is the focus of section six. The expansion of energy communities is fundamental to verify the feasibility of the proposed project since they represent the potential market.

Section seven is dedicated to drafting a business model for a legal entity that collects revenues of existing RECs to finance the birth of new ones.

Section eight will describe the selected legal nature of the entity and the influence it has on the business model.

Section nine analyses the entity's business plan.

Section ten measures the positive impacts this initiative can generate. The selected dimensions to measure the impact are number of RECs financed, environmental benefits, and socio-economic benefits.

Section eleven tries to quantify the risks that may be encountered when developing such a project.

Section twelve, instead, will provide brief conclusions commenting on the feasibility of the project and will give suggestions for future research.

The Business Model: EnerLend's Way

It is worth describing EnerLend's business model since it can be considered the bulk of the thesis.

Creating a Network

The main activities necessary to give birth to an energy community are divided into three dimensions, bureaucratic, technical, and economic. It is crucial to include two types of partners in the first place. The first one can manage all the bureaucratic activities necessary to establish the configuration with a more legal background. Instead, the second one must be capable of providing the energy community with the technical infrastructure. In the project's initial phase, particular attention should be paid to the economic activities necessary in the setup phase and, specifically, to the financing part. The organization will not have enough capital to set up an energy community in its early stage. For this reason, EnerLend can, initially, search for investors. It is essential to mention that the relevance of a network and the idea of approaching RECs in their initial phase is because asking already established energy communities to manage their resources might face some resistance (Mori, 2022). The proposed network generates business opportunities for all the partners involved creating an incentive to enter.

Collecting Capital

Once the energy communities have been set up and have reached their payback time, EnerLend can start collecting profits of existing RECs. Again, this will be done on an online platform. EnerLend will retain a fee on the capital collected.

Investment phase

EnerLend can now start investing the collected capital in financing new energy communities. The benefits for the members of established energy communities are reflected in the interest rate on the investment.

The following image summarizes the main steps envisaged in the business model.

Figura 1 EnerLend's main step

The image below summarized EnerLend's business model underlining the revenue stream.

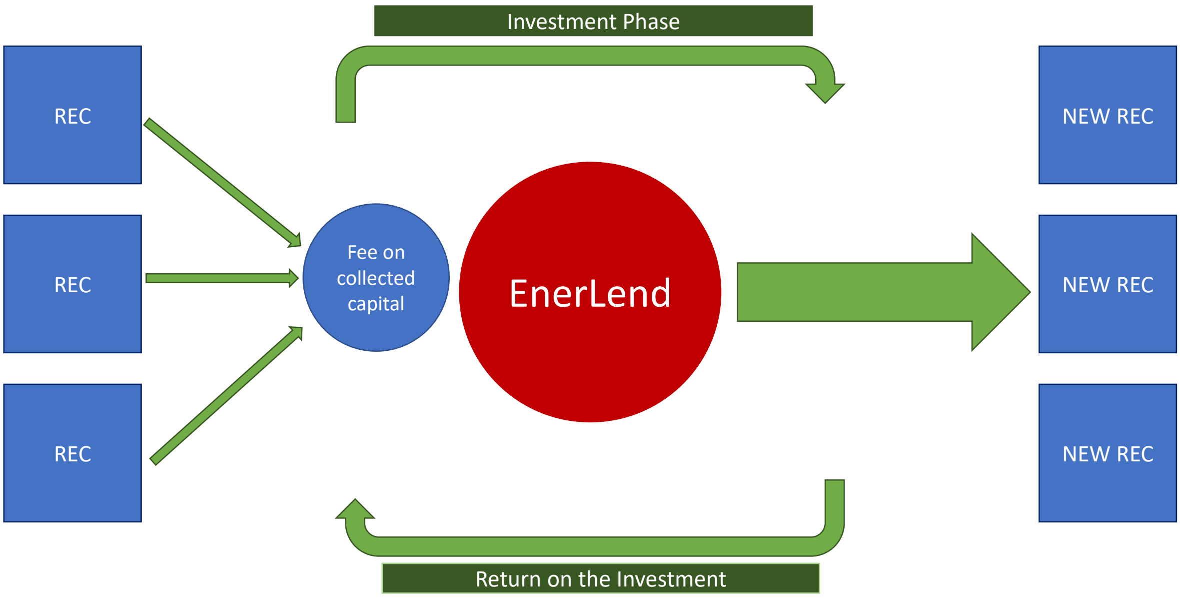

Figura 2 EnerLend's Business Model

The Added Value

EnerLend's competitors are both mainstream financial institutions, especially banks, and other crowdlending platforms.

Let us start by comparing EnerLend with banks. The actors interested in creating an energy community could ask a bank for a loan. On the one hand, this is true and can potentially pose a threat to the proposed business. On the other hand, this solution has a more holistic approach. As was previously mentioned finding funding for an energy community is only one of the activities to create an energy community. Offering an integrated solution that also addresses the bureaucratic and technological dimensions reduces the burden on the customer. Furthermore, EnerLend foresees solutions to increase the revenues of existing RECs, representing a further incentive for potential customers. It is also worth mentioning that banks still have not understood the potential of energy communities, and currently, there are not many offers dedicated to these configurations (Mori, 2022). This situation may lead to first-mover advantages. It is also worth mentioning that banks offer several services and have different investment strategies that focus on several financial instruments and sectors. Instead, EnerLend focuses only on energy communities, with a clear and distinctive investment strategy. This allows the proposed entity to be more recognizable on the market for the energy community sector.

For what concerns other crowdlending platforms the main competitor in this field is Ener2Crowd (Osservatori Entrepreneurship Finance & Innovation, 2021). This platform is specialized in green projects and sustainable investments (renewable energy production, industrial and residential energy efficiency, sustainable mobility, and projects with social impact). It uses the 'direct' model, and Internet users can select their favorite projects. Despite Ener2Crowd being a very successful platform, some aspects can still differentiate EnerLend and assure a good performance on the market.

In the first place, EnerLend will adopt a diffuse business model, reducing the burden on customers. In the second place, the target market is different. Ener2Crowd targets online investors in general to finance green projects. EnerLend will specifically target Renewable Energy Communities and focus its investment strategy on financing new energy communities. EnerLend aims to establish its presence in the niche market of Renewable Energy Communities.

Furthermore, EnerLend partially addresses a typical problem of crowdinvesting platforms, the one informational asymmetry. Since the incentives for Renewable Energy Communities are fixed by law, it is easier to assess the risk of the investment. Lastly, it is worth mentioning that EnerLend goes beyond providing a financial service. An essential part of its business model is creating a multi-stakeholder network to support the birth and growth of renewable energy communities. This approach helps to engage with the customer early, building customer loyalty.

SWOT Analysis

The strength of the project resides in the relatively simple business model. The investment strategy is clear and focuses on one main target. Furthermore, given the current incentive scheme RECs have excellent business plans that can assure a significant return on the investment. Another strength of the project is its scalability. EnerLend can change its targets and investment strategy, given the relatively simple business model. It could open up to investors other than RECs and find new investment opportunities other than renewable energy communities. Furthermore, the incentives a renewable energy community can receive last for twenty years. These characteristics assure a relatively secure supply of capital. It is also worth mentioning that the incentives energy communities receive, as we have seen, are fixed by law, drastically reducing uncertainty.

The main weakness of the project is the difficulty that may be encountered in building a network. In the first place, it might be difficult for potential partners to understand the benefits related to such an initiative entirely. Energy communities are a relatively young topic; hence there are still some issues regarding awareness. This might hinder the network-building process, which is fundamental to EnerLend. In the second place, building a network can result in a time-consuming activity that can reduce the competitive advantage of being a first mover.

Despite this, several opportunities can contribute to the development of the project. In the first place, as we have previously discussed, the legislative framework. The latter contributes to the solidity of a REC's business plan. In the second place is the Italian National Recovery and Resiliency Plan. It allocates many resources to promote renewable energy sources and energy communities. This represents a massive opportunity for the energy community sector to grow hence contributing to the feasibility of EnerLend's business model. Finally, in the third place, renewable energy sources are rapidly climbing the EU's and Italy's agendas (European Commission, 2019; Ministero dell Sviluppo Economico, 2019). Several measures have been implemented, and others still have to be.

There is general momentum behind promoting renewable energy sources and energy communities, but there are still some threats. First of all, the RED II still has not been transposed into its definitive version. In particular, there might be a change in the value of the incentives. This, of course, can harm the project. In the second place, it is worth mentioning that EnerLend heavily relies on the expansion of energy communities. If the market is incapable of growing as expected, the project's success can be seriously threatened.

The Findings: EnerLend's sustainability

The following table summarizes the assumptions made.

Assumptions	
Number of total RECs by 2025	30000
Currently Existing RECs	21
Additional Renewable Energy Communities per year	7495
EC - Cluster 1	45%
EC - Cluster 2	45%
EC - Cluster 3	10%
Total potential Customers by 2025	27000
Total potential Customers every year until 2025	6750
Market Share (Years 1-5)	16%
Market Share (Years 6-10)	19%
Market Share (Years 11-15)	22%
Market Share (Years 16-20)	25%
Average yearly GM of a REC (100kW)	7.615,34 €
Capital collected (years 1-5)	8.250.154,53 €
Capital collected (years 6-10)	9.766.673,30 €
Capital collected (years 11-10)	11.308.779,61 €
Capital collected (years 16-20)	12.850.885,92 €
Fee on collected capital	2,00%
Cost of perpetual licence and source code	90.000,00 €
Number of Employees	4
Average salary	2.500,00 €
Payment processing cost (% on transaction)	0,5%
Hosting Provider	480,00 €
Platform's maintanance costs	1.200,00 €

Figura 3 Assumptions made to develop EnerLend's business model

The total costs EnerLend faces are summarized in the following table. On the left column, the type of cost is specified; instead, on the right column, the total costs after twenty years are displayed.

Costst (20 years)	
Perpetual licence and source code	90.000,00 €
Personnel	2.600.000,00 €
Payment processing costs	1.033.324,09 €
Hosting Provider	9.600,00 €
Platform Maintaianance costs	24.000,00 €
TOTAL	3.756.924,09 €

Figure 27 Overview of the costs

The total revenues are summarized in the following table. On the left column, the type of revenues is specified; instead, on the right column, the total revenues after twenty years are displayed.

Revenues (20 Yyears)	
Collected Fee	4.217.649,34 €
TOTAL	4.217.649,34 €

Figura 4 Overview of the revenues

The following table summarizes total costs, revenues, and the gross margin after twenty years.

Economics (20 years)	
Total Costs	3.756.924,09 €
Total Revenues	4.217.649,34 €
GROSS MARGIN	460.725,25 €

Figura 5 Overview of the total costs, total revenues and gross margin

Instead, the following graph provides an overview of the gross margin across the twenty years considered.

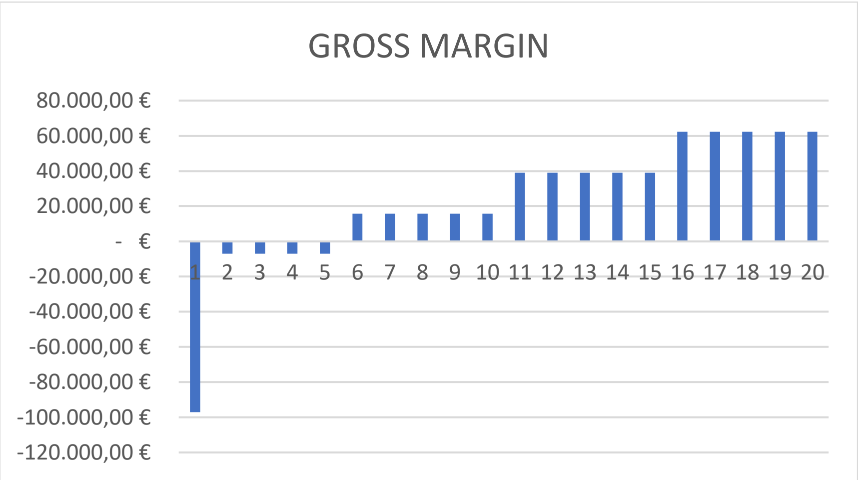

Figura 6 Overview of the gross margin across the selected period

As we can see from the graph, the company will start to register profits starting from the sixth year and recover from all the costs in twelve years. This data aligns with current market trends; in fact, crowdinvesting platforms usually have long payback times (Osservatori Entrepreneurship Finance & Innovation, 2021). It is also worth reminding that the chosen fee on the collected capital is very competitive, considering that the latter ranges from 2% to 10% when considering crowdinvesting platforms (Ibid).

Conclusions and Future Research

We can conclude that it is feasible to create a legal entity that collects capital generated from the profits of existing energy communities in order to finance new ones while at the same time protecting the interests of existing members. Furthermore, the adequate legal entity has been individuated. Nevertheless, some limitations must be taken into account. In the first place, to carry out the feasibility analysis, some assumptions had to be made, and in some cases, there was no extensive data. In the second place, as we have previously seen, the new incentive scheme to put the transposition of the RED II directive into practice is still not ready. A change in the incentive scheme might alter the business plan of EnerLend, making it either less sustainable or unsustainable from an economic perspective.

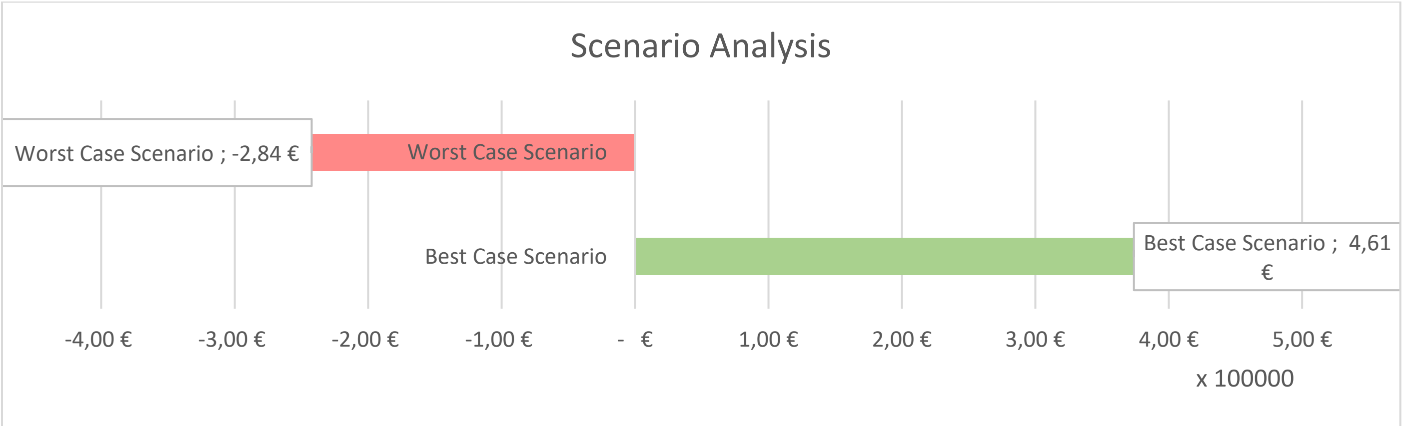

Figura 7 Effects of a reduction of the incentives (from 110€/MWh and 9€/MWh to 90€/MWh and 9€/MWh) on EnerLend's gross margin after 20 years

In the third place, this project heavily relies on expanding energy communities. Despite all the positive signals, we cannot take for granted that this expansion will happen. If energy communities do not reach a significant number of units, EnerLend's target market will not be economically sustainable.

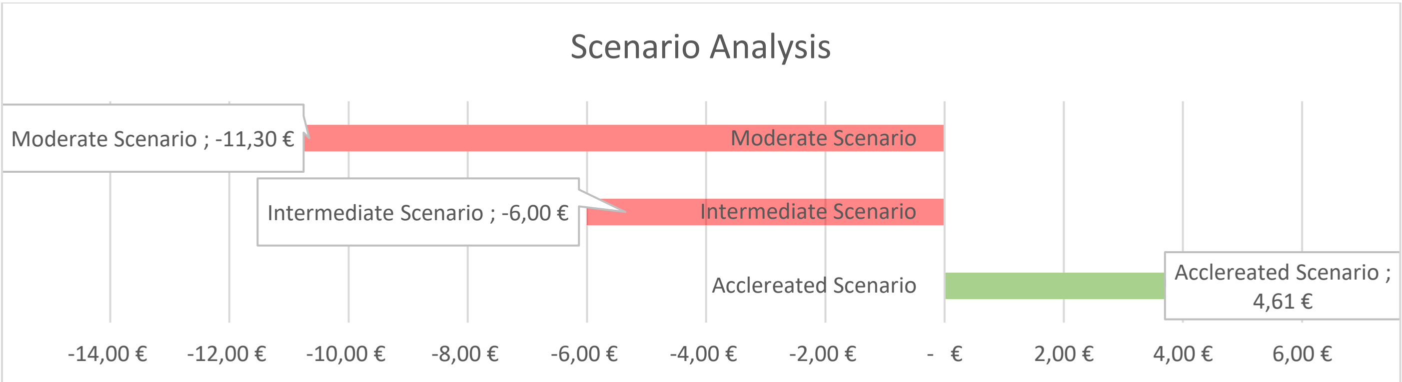

Figura 8 The figure shows three different scenarios. In the moderate one there will be 15000 RECs by 2025, in the intermediate 20000 and in the accelerated 30000

In the fourth place, within the business plan, it has been considered that actors interested in giving birth to an energy community will have access to the 50% deduction to purchase photovoltaic panels. This measure will stay in place until the end of 2024, but it is interesting to see whether future incentives, like the 50% deduction, will be so advantageous. Lastly, the regulation for crowdfunding platforms is expected to change, especially in Italy, where this phenomenon is still not adequately regulated (Michele Perrino, 2022). Changes within the regulatory framework might make it less accessible to set up a business in the crowdfunding sector and impose stricter regulations.

This project has touched upon some issues that could inspire future research. As we have previously seen, energy communities are expected to proliferate. For this reason, as Gjorgievski et al. has pointed out, further research must be done on the conflicting interests of different actors that may arise. In addition, the diffusion of energy communities can impose costs on other actors, such as DSOs (Gjorgievski et al., 2021). Further research must be done to ensure that the diffusion of energy communities does not only benefit members. Another aspect that is worth considering is the diffusion of renewable energy sources. As we have seen in the reports published by the Energy & Strategy group, photovoltaic solar energy is the most diffused. It will be interesting to see how the diffusion of other renewable energy sources will influence energy communities. Connected to this issue is also the study on the best mixture of renewable energy sources to assure constant production. This is especially important for Italy where the most diffuse RES is photovoltaic which of course is not capable of producing energy at nighttime. Lastly, it will be interesting to study how the business plans of energy communities will change once they stop receiving incentives.