

sustaiNav^uility

NAVARRE, A REGION SUPPORTING THE SUSTAINABLE ENERGY

Benchmarking document containing the
best practices in Europe in participative
projects

Version 2.0

Date May 2020



The project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement n°785045.
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DOCUMENT CODIFICATION

Project number	785045	Acronym	sustainAVility
Full title	Navarre, a region supporting the sustainable energy		
Project URL			
Document URL	-		
EU Project officer	Christophe MILIN		

Deliverable	Number	D2.6	Title	Benchmarking document containing the best practices in Europe in participative projects
Work package	Number	WP2	Title	Mobilisation of Public Investments in Sustainable Energy Projects

Date of delivery	Contractual:	M12	Final Delivery:	M28
Author	GN (Íñigo Olagüe, Óscar Fernández)			
Status				
Contributing beneficiaries				
Nature	Report			
Revisions				
Dissemination level	PU			
Abstract for dissemination	Best practices in Europe in participative projects			
Keywords	Energy Poverty, climate change, decarbonisation, net zero emission, renewable gases, electric transport system			

PU = Public

PP = Restricted to other program participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

CO = Confidential, only for members of the consortium (including the Commission Services)

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1 Introduction

Spain has a high potential production in renewable energy.

Thanks to these energies we are moving towards more distributed energy, reduction of emissions and energy dependence, as well as increasing the employment rate and rural development.

Within a decentralised energy production system, energy communities that produce sustainable energy constitute a particular case of local production units, in which the generation facility is property of multiple owners.

The sustainable energy communities (SEC) are organisations whose members are involved in the design and implementation of measures aimed at the rational use of energy and the implantation of renewable energy for the production, consumption and/or commercialisation of electric energy, thermal, mechanical or fuel.

It is desirable that, apart from the energy use measures, others will be established for rational use of water and local resources, such as recycling and waste recovery.

The SEC have several legal forms, business models and financing according to diverse factors: normative context, used renewable sources, geographic location, degree of ownership and/or involvement of the local population.

The SEC promote energy savings and improve public awareness and acceptance of renewable energy, as well as contribute to development of distributed generation, reduction of energy dependence and fulfilment of energy, environmental and social goals.

The sustainAVility project is developed in Navarra, an ideal location for renewable energies due to the fact that it has different places (desert, mountainous areas, ...) where multiple technologies such as photovoltaic, wind and hydraulic can be implemented. Navarra is a leader in this area due to the large companies in the renewable sector that have made Navarra aware of the use of these energies. For example, in 2008, 69.22% of the energy consumed in Navarra was produced by renewable energies and the internal production of primary energy (100% renewable) is 22.18% of the total consumption of primary energy.

In this document, the most frequent ownership models of renewable installations in Denmark, Germany and Spain will be studied and the best circumstances to design SEC (opportunities) and their barriers will be identified. Possible solutions will be proposed to mitigate the difficulties and to accelerate SEC development.

Two countries have been chosen to facilitate the analysis and the proposal of solutions. These reference countries are Denmark and Germany that have a great development in the SEC and will be compared to Spain.

2 European regulation

2.1 Context

Energy communities and consumer (co-)ownership in renewable energy (RE) are essential cornerstones to the overall success of the Energy Transition. When consumers acquire ownership in RE installations they can become prosumers, generating a share of the energy they consume. This allows them to reduce their overall expenditure for energy and simultaneously acquire another source of income from the sale of excess production. Prosumership is expected to be increasingly embedded in energy communities that entail a broad variety of actors. From a technical point of view, these organisational shifts in energy generation, supply and management happen in the context of the growing complexity of energy systems and what we define in this paper to be “renewable energy clusters” (RE clusters). Although both the governance model of energy communities and the engineering model of energy clusters are acknowledged in practice, until now comprehensive regulation is a novelty, and consequently, so are corresponding definitions.

In June 2018, the European Union (EU) agreed on a legal framework for prosumership as part of the recast of the Renewable Energy Directive (RED II), which entered into force in December 2018. The 28 Member States of the EU now have until June 2021 to transpose the RED II into national Law and from then on consumers, as prosumers, will have the right to consume, store or sell RE generated on their premises.

- ✱ individually, that is, households and non-energy small and medium sized enterprises (SMEs) and collectively, for example in tenant electricity projects (Art. 21 RED II)
- ✱ (ii) as part of Renewable Energy Communities organised as independent legal entities (Art. 22 RED II).

The RED II is part of the Clean Energy for all Europeans Package of the European Union and its rules are embedded in those of the 2019 Internal Electricity Market Directive (IEMD) and Regulation (IEMR), both of which reached political agreement in the inter-institutional negotiations (so-called Trilogue) on 18 December 2018.

2.2 RED II

In accordance with RED II, a renewable energy community is a legal person that has the following characteristics:

- ✱ Based on open and voluntary participation.
- ✱ Autonomous.
- ✱ Controlled by shareholders or members that are involved in renewable energy projects.

- ✦ It works on the basis of the applicable national legislation.

Their shareholders or members are natural persons, small and medium-sized enterprises or local authorities, municipalities included. The major objective of the community is to provide economic, social, and environmental benefits rather than financial benefits to shareholders or members. As a matter of fact, the European Directive reveals that the participation in an energy community should not constitute main commercial or professional activity for the members / shareholders.

Renewable energy communities have the right to:

- ✦ Produce, consume, store and sell renewable energy, in particularly through purchase agreements of renewable energy.
- ✦ Access directly or by aggregation at all energy markets.

2.3 IEMD

The IEMD proposal defines the citizen energy community as a legal entity that is based on voluntary and open participation, controlled by the shareholders or members which must be individuals, local authorities, municipalities or micro and small-sized enterprises. The main purpose is to provide environmental, financial or social benefits for their members or for the local areas where they operate, instead of financial gains.

These communities can be involved in electricity generation, distribution and supply, consumption, aggregation, storage or energy efficiency services, renewable electricity generation, recharging services for electric vehicles or to provide other energy services for the shareholders or members.

The IEMD proposal obliges the member states to establish a favourable regulatory framework for the citizen energy community. The membership is based on open and voluntary participation.

The members or shareholders will not lose their rights and obligations as active and domestic consumers. Concerning self-consumption, citizen energy communities should be treated like active clients. Where electricity is shared, it must be in line with a transparent cost-benefit analysis of distributed energy resources developed by the competent national authority.

The range of activities mentioned in the proposal includes generation, supply, ownership of the distribution network, and management (subject to individual decision of the member state) and market share, directly or through aggregation.

2.4 RED II-IEMD comparison

“Energy communities” are mentioned and defined in both the RED II and the IEMD and so is the concept of “energy sharing” within them. RED II clearly refers to renewable energy projects (referring to the “renewable energy communities”), while the IEMD proposal uses the term “citizen energy community”, without limiting the scope only to renewable energy technologies. However, the electricity is the priority. In that sense, the RED II is stricter and closer than the IEMD proposal.

IEMD defines the role of energy communities in the energy system, including cooperation with network operators and their possible activities along the value chain. RED II pays attention to renewable energy and focuses on the foundations of policy and regulatory support to remove potential barriers and to encourage the exploitation of potentials of energy communities in member states.

While the purpose of IEMD/R is the completion of the internal market, that of RED II is to specifically support the deployment of renewable energy sources (RES) for energy production including electricity and to foster acceptance for renewables among Europeans. Both directives expressly see the consumer “at the heart of the energy markets” defining them – individually or jointly – as “Active Consumer” (IEMD) respectively as “Renewable Self-consumer” (RED II).

Below a table with the comparison of both regulations previously is exposed:

	REDII	IEMD
Production of energy:		
Renewable electricity	Yes	Yes
Non-renewable electricity	No	Yes
Renewable heat	Yes	No
Renewable transport	Yes	No
Energy sharing	Yes	Yes
Distribution	No	Yes
Supply	No	Yes
Balancing responsibility	Yes	Yes
Consumption of energy	Yes	Yes
Aggregation	No	Yes
Energy storage	Yes	Yes
Efficiency services	No	Yes
EV charging	No	Yes
Energy services	No	Yes

	REDII	IEMD
Sales of energy	Yes	Yes
Market access	Yes	Yes
Possibility of cross-border participation	Yes	Yes
Legal entity	Yes	Yes
Voluntary and open Membership	Yes	Yes
Specific governance	Yes (effectively controlled by members/shareholders)	Yes (effectively controlled by members/shareholders)
Collective action in the energy field	Yes	Yes
Members	Natural persons, local authorities, including municipalities, SMEs	natural persons, local authorities, including municipalities, small enterprises and microenterprises
Locational limitation	Yes (local proximity)	No
Type of energy	All RES	Electricity only
Technology neutral	No (Only RES)	Yes
Purpose	provide environmental, economic or social community benefits for its shareholders/ members or the local areas where it operates rather than financial profits	provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits
Activities of energy communities	Limited: Producing, consuming, storing	Broad: Electricity

	REDII	IEMD
	and selling renewable energy (also through PPA)	generation, distribution and supply, consumption, aggregation
Electricity sharing	Yes	Yes
Imbalance responsibility	Yes	Yes
Non-discrimination	Yes	Yes
Market Access	Yes	Yes
Consumers protection	Yes	Yes
Support provisions	Tools to facilitate access to finance and information; regulatory and capacity-building support to public authorities in enabling and setting up renewable energy communities; Member states shall consider specificities of RE communities when designing support schemes	n.a.
DSO status	n.a.	Member States may allow the DSO status
Cross-border participation	Possible	Possible

Table 1

3 State regulations

3.1 Context

The transposition of these comprehensive rules – in particular those on energy communities – requires developing, implementing and rolling out business models that broaden the capital participation of consumers in all 28 Member States while permitting co-investments of different type of actors. Amongst others, Member States have to adopt an “enabling framework” for prosumership, in particular for renewable energy communities (RECs). Defining citizen’s rights and duties, the directive links prosumership to such different topics as fighting energy poverty, increasing acceptance, fostering local development and incentivising demand-flexibility. The IEMD amongst others provides energy communities with a level playing field vis-a-vis other market participants. RED II on the other hand additionally has an important vertical element as it ensures for example that RECs can compete for support “on an equal footing with other market participants” and calls on the Member States to “take into account specificities of renewable energy communities when designing support schemes”. While the framework under IEMD is primarily a regulatory framework, that of RED II has the explicit aim “to promote and facilitate the development of RECs” including preferential conditions or incentives. In summary, RECs are a specific form of citizen energy communities (CECs) benefitting from an “enabling framework” that promotes and facilitates their development.

Several state regulations are shown below that do not meet the definitions of the RED II and IEMD energy community due to two main characteristics: capital ownership and location.

3.2 Germany

To ensure the participation of local energy communities in national auctions, the German renewable energy law 2017 introduced special rules for community wind energy that applied to the first three rounds of onshore wind auctions. The preferential participation rules were applied to “citizen energy communities”, that is, companies consisting of at least 10 natural persons who are members or shareholders with voting rights. Otherwise, most voting rights have to live for at least one year in the same district in which the wind installations to be built are planned. Those who meet these criteria benefit from the following privileges:

- ✧ For community projects the implementation period is two years longer than normal.
- ✧ The intention behind these privileges was to reduce entry barriers for local renewable energy communities and to ensure that they can take part in the new onshore wind energy auction, drastically distorting the market.

- There will be better offers for this type of communities, which will help them to be more competitive and to participate in auctions against large companies.
- The government decided to remove these aids because citizen participation was too high and there were no short-term projects to guarantee the continuity of these auctions.

Currently the government is planning to reduce entry barriers for citizen energy communities to help them participate in wind energy auctions by introducing investment aid. These grants must be understood as financial support that must be successfully submitted in the long and expensive process of wind farms, which is a prerequisite for participating in onshore wind energy auctions. Once the permission has been issued and a support right has been successfully granted in an auction procedure, then the grant would have to be refunded.

Below a comparative table between European regulations and German regulation is shown:





	REDII	IEMD	German energy community auctions
Legal entity	Yes	Yes	Yes
Members	Natural persons, local authorities, including municipalities, SMEs	natural persons, local authorities, including municipalities, small enterprises and microenterprises	Only local citizens
Locational limitation	Yes (local proximity)	No	Yes
Type of energy	All RES	Electricity only	Wind power
Purpose	provide environmental, economic or social community benefits for its shareholders/ members or the local areas where it operates rather than financial profits	provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits	Provide preferential treatment for energy communities
Electricity sharing	Yes	Yes	Yes
Imbalance	Yes	Yes	Yes

	REDII	IEMD	German energy community auctions
responsibility			
Non-discrimination	Yes	Yes	Yes
Market Access	Yes	Yes	Yes
Consumers protection	Yes	Yes	Yes
DSO status	n.a.	Member States may allow the DSO status	No

Table 2

3.3 Denmark

The Danish government supports community participation in renewable energy projects through four measures:

-  The “purchase option” scheme.
-  The “loss of value” scheme.
-  The Green Plan.
-  The Guarantee Fund.

3.3.1 Purchase option:

Wind energy project promoters offer financial shares in new wind energy projects to local citizens. Local citizens have the right to buy new shares corresponding to at least 20% of total investments. Citizens over the age of 18 living within a radius of up to 4 km from the project can purchase up to 50 shares in a new project (share size: 1,000 kWh output per share). If the shares are not sold on their first priority rule, project developers must offer shares to the rest of the municipality (second priority). In the case of facilities near the coast, this second priority grants the right of purchase, up to 16km. Local investors share the same rights, obligations, risks and benefits as other investors.

3.3.2 Loss of value:

This option compensates local citizens for any lost property values related to project completion. The loss in value is determined by the independent competent authority. Owners are compensated if the lost value equals more than 1% of the property value.

3.3.3 The Green Plan:

It is a municipal orientation support system. Its objective is to improve the incentives of the municipalities for the development of renewable energies. Municipalities that approve new wind energy projects can apply for financing for recreational projects that improve life or benefit local citizens in other ways.

The payments are understood as compensation for the negative environmental impact and they are related to the number and size of the installations. The funds come from the state budget.

3.3.4 The Guarantee Fund:

It offers financial guarantees of up to 67.000€ to financial institutions that lend money to local wind energy cooperatives. In case the project is not carried out, the guarantee fund covers the loss. The cooperatives must have at least 10 natural persons with concession right as members. Most of the members must be residents of the municipality or live 4.5km away.

Below a comparative table between European regulations and Danish regulation is shown:

	REDII	IEMD	Danish community rules
Legal entity	Yes	Yes	No
Members	Natural persons, local authorities, including municipalities, SMEs	natural persons, local authorities, including municipalities, small enterprises and microenterprises	Municipalities and local cooperatives
Locational limitation	Yes (local proximity)	No	Yes
Type of energy	All RES	Electricity only	Wind power
Purpose	provide environmental, economic or social community benefits for its shareholders/ members or the local areas where it operates rather than financial profits	provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits	Provide additional compensation to communities where wind power is developed
Electricity sharing	Yes	Yes	Yes
Imbalance responsibility	Yes	Yes	n.a.
Non-discrimination	Yes	Yes	Yes
Market Access	Yes	Yes	Yes

	REDII	IEMD	Danish community rules
Consumers protection	Yes	Yes	Yes
DSO status	n.a.	Member States may allow the DSO status	No

Table 3

3.4 Spain

In Spain Royal Decree 244 was approved on April 6, 2019, where the different concepts on self-consumption and renewable energy are updated, which facilitates the implementation of these energies and avoids the possible barriers that existed up to that time.

In this document different characteristics are exposed so that an installation can be considered of nearby production and associated with consumption. Through which one or more consumers can belong to the following types of self-consumption:

- ✱ Connected to the internal network of associated consumers or connected to them through direct lines.
- ✱ Connected to any low voltage network derived from the same transformation centre.
- ✱ Generation and consumption connected in low voltage and at a distance lower than 500m. For this purpose, the distance between the measurement equipment will be taken in its orthogonal flat projection.
- ✱ Generation and consumption located in the same cadastral reference according to its first 14 digits or according to the provisions of the twentieth additional provision of Royal Decree 413/2014, of June 6, whose electricity production activity is regulated from renewable energy sources, cogeneration and waste.

3.4.1 Collective self-consumption:

In this regulation, within the possibilities of self-consumption, there is one that is collective self-consumption, where a consuming subject supplies the energy to several consumers. There are several types of self-consumption according to different characteristics of the installation.

3.4.1.1 Modality of supply with self-consumption without excess.

In these modalities, an anti-discharge mechanism must be installed to avoid the injection of excess energy into the transmission or distribution network. In this case there will be only type of subject that will be the consuming subject.






3.4.1.2 Modality of supply with self-consumption with excesses.

In these modalities, the nearby production facilities associated with the consumption ones can, in addition to supplying energy for self-consumption, inject excess energy into the transmission and distribution networks. In these cases there will be two types of subjects, which will be the consuming subject and the producer.

The modality of supply with self-consumption with excesses is divided into two alternatives.

3.4.1.2.1 Modality with excesses accepted for compensation

Those cases of supply with self-consumption with surpluses, in which the consumer and producer voluntarily choose to use an excess compensation mechanism, will belong to this modality. This option will only be possible in those cases in which all the conditions listed below are met:

-  The primary energy source is of renewable origin.
-  The total power of the associate production facilities does not exceed 100kW.
-  If the renewable production facilities require a set of external auxiliary supplies to allow the operation, these supplies have to be merged in a single contract of energy supply to the production facilities, to be established with an energy commercialising company.
-  The consumer and associated producer have signed a contract for the compensation of excess self-consumption.
-  The production facility has not received an additional or specific remuneration.

3.4.1.2.2 Modality with excesses not accepted as compensation:

All those cases of self-consumption with excesses that do not meet any of the requirements to belong to the modality with excesses accepted for compensation or who voluntary choose not to take advantage of this modality, belong to this modality.

Below a comparison table between European and Spanish regulation is shown:

	REDII	IEMD	Spanish rules
Legal entity	Yes	Yes	Yes
Members	Natural persons, local authorities, including municipalities, SMEs	natural persons, local authorities, including municipalities, small enterprises and microenterprises	natural persons, local authorities, including municipalities, small enterprises and microenterprises
Locational limitation	Yes (local proximity)	No	Yes (local proximity)

	REDII	IEMD	Spanish rules
Type of energy	All RES	Electricity only	All RES
Purpose	provide environmental, economic or social community benefits for its shareholders/ members or the local areas where it operates rather than financial profits	provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits	provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits
Electricity sharing	Yes	Yes	Yes
Imbalance responsibility	Yes	Yes	Yes
Non-discrimination	Yes	Yes	Yes
Market Access	Yes	Yes	Yes
Consumers protection	Yes	Yes	Yes
DSO status	n.a.	Member States may allow the DSO status	n.a.

Table 4

3.5 Comparison among regulations

There are two similar trends, the German and the Danish, where there is great support for the creation and economic viability of this type of project.

Despite their similarities, there are differences, for example in Denmark there has been pressure for local participation and compensation, but not for cooperative governance. Nor did it introduce economic privileges for RES cooperation projects (with the exception of the guarantee fund). Furthermore, Germany presented economic privileges for local cooperatives. However, the difficulty of finding a solid legal definition for these cooperatives, combined with excessive privileges, has initially led to unintended consequences and market distortions. This highlights the difficulty of protecting a certain market segment within RES auctions. A lesson learned is that supporting provisions for renewable energy communities to reduce market entry barriers must be carefully designed and not overly generous.

Contrary to RED II provisions, neither Denmark nor Germany establish profit (non-profit) requirements for renewable energy communities.

In the case of Spanish regulation, there is no specific definition of a renewable energy community. Therefore, the establishment of the different characteristics that should be included in such a definition would be desirable, therefore enabling the community to benefit from the use of renewable energy. It is a more restrictive regulation when taking advantage of this new opportunity, since it has several factors that limit the easiness factors that other regulations have.

4 Study projects

Below different projects in the countries previously studied are shown to proceed with their study and comparison.

4.1 Odenwald in Germany: Solar cooperative.

4.1.1 Goals:

The overall goal is to be 100% fossil energy independent, thus producing less CO₂ and promoting clean, renewable energy.

4.1.2 Scope:

It is a project at the local level, where only residents of the towns close to the project can be members of this cooperative.

4.1.3 Participating entities:

In the beginning, the cooperative was started by the Volksbank Odenwald bank as it saw the potential local economic development with renewable energies. Nowadays this cooperative has grown so much that it has become independent from its creator, although they operate in close collaboration.

Local entities in the area also participate in this cooperative by giving or renting roofs of public buildings to the cooperative for the installation of photovoltaic panels.

The beneficiaries are the residents of the neighbourhood of the projects that can become partners and consume the energy generated by such facilities.

4.1.4 Best practices and initiatives:

It currently sells its own-generated electricity to customers not belonging to the cooperative, but it intends to start selling its own electricity directly to its members.

Below a comparison table between European regulations and this project is shown:

	REDII	IEMD	Odenwald
Legal entity	Yes	Yes	Yes
Members	Natural persons, local authorities, including municipalities, SMEs	natural persons, local authorities, including municipalities, small enterprises and microenterprises	natural persons, local authorities, including municipalities.
Locational	Yes (local proximity)	No	Yes (local

	REDII	IEMD	Odenwald
limitation			proximity)
Type of energy	All RES	Electricity only	Solar and wind energy
Purpose	provide environmental, economic or social community benefits for its shareholders/ members or the local areas where it operates rather than financial profits	provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits	provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits
Electricity sharing	Yes	Yes	Yes
Imbalance responsibility	Yes	Yes	Yes
Non-discrimination	Yes	Yes	Yes
Market Access	Yes	Yes	Yes
Consumers protection	Yes	Yes	Yes
DSO status	n.a.	Member States may allow the DSO status	n.a.

Table 5

4.2 Middelgrunden in Denmark: Maritime wind energy

4.2.1 Goals:

The overall goal is to be 100% fossil energy independent, thus producing less CO₂ and promoting clean, renewable energy.

4.2.2 Scope:

It is a national project. In this specific case, the wind farm supplies the city of Copenhagen, as it is located in its neighbourhood.

4.2.3 Project horizon:

Denmark is working so that by 2050 it can be the first country in the world with zero carbon.

4.2.4 Participating entities:

Out of 20 turbines that make up Middelgrunden, 10 belong to the energy company DONG Energy and the rest to a public cooperative that was founded when the project began.

4.2.5 Best practices and initiatives:

- Showing citizens that wind blowing daily in the city can have its positive side: producing clean energy, saving costs and, of course, generating economic benefits.
- Promoting the use of bicycle and public transport by citizens.
- In the future, replacing coal with biomass, clean energy.
- Aiding to R&D in the energy field, making Denmark a leading country in the wind energy sector.
- It is a cooperative where any natural person can be a shareholder and be part of it.
- The amount of energy corresponding to each share equals the production in kWh divided by the number of shares. Each partner has the possibility to buy as many shares as they want.
- There is an annual assembly where presidential decisions, budgets, benefits, improvement proposals are made.
- Each partner has one vote.

Below a comparison table between European regulations and this project is shown:

	REDII	IEMD	Middelgrunden
Legal entity	Yes	Yes	Yes
Members	Natural persons, local authorities, including municipalities, SMEs	natural persons, local authorities, including municipalities, small enterprises and microenterprises	Individuals, companies and housing associations
Locational limitation	Yes (local proximity)	No	No
Type of energy	All RES	Electricity only	Wind power
Purpose	provide environmental, economic or social community benefits for its shareholders/	provide environmental, economic or social community benefits for its members or the	Produce wind power from an offshore project

	REDII	IEMD	Middelgrunden
	members or the local areas where it operates rather than financial profits	local areas where it operates rather than financial profits	
Electricity sharing	Yes	Yes	No
Imbalance responsibility	Yes	Yes	Yes
Non-discrimination	Yes	Yes	Yes
Market Access	Yes	Yes	Yes
Consumers protection	Yes	Yes	Yes
DSO status	n.a.	Member States may allow the DSO status	No

Table 6

4.3 Energy community in Esparza (Navarra, Spain): photovoltaic

4.3.1 Goals:

The overall goal is to be 100% fossil energy independent, thus producing less CO₂ and promoting clean, renewable energy.

4.3.2 Scope:

It is a photovoltaic project at the local level, specifically in the "Concejo de Esparza", a small village of 378 inhabitants in Navarra.

4.3.3 Participating entities:

The Esparza council has promoted and financed this project. The total investment was 30,863.76€, for which it received a grant from the Government of Navarra of 21,078.55€, which represented a cost to the Council of 9,785.21€.

The beneficiaries of this project are those of the village who wish to participate in such cooperative and thus consume the energy produced by the photovoltaic installation. For this very reason, the Esparza Energy Community has been created, made up of the Council itself and its neighbours.

4.3.4 Best practices and initiatives:

The project has achieved such a social awareness that most people want to participate in this project, so that the photovoltaic panels generate electrical energy to become increasingly self-sufficient, reducing the energy consumption from the distribution grid.

The aim is to gradually implement new photovoltaic installations on the roofs of other public buildings and of the residents themselves, so that the energy produced is distributed among the different members of the Esparza Energy Community. To do this, the collaboration of an energy trading company facilitates the distribution of the energy produced among the members of the Energy Community.

4.3.5 Extra information:

Esparza is a small village of 378 inhabitants belonging to the "Cendea de Galar". In 2019, the council approved the execution of a photovoltaic installation on the roof of the "Pelota" sport hall to cover its own consumption, pursuing an environmental objective and the promotion of renewable energy above other issues.

For this purpose, the large sport hall roof is used to host photovoltaic panels. A preliminary study has been carried out, which has estimated that the power on such roof can be 17.82 kWp.

The system is remotely monitored, having a screen in the multipurpose room of the council building in which the main parameters and generation data of the installation are exposed.

This installation allows generating 25,588 kWh / year, an amount that comes to cover more than 100% of the council's energy needs, which are 24,091 kWh / year. In addition, it must be taken into account that a large part of this consumption is due to street lighting at night, when the photovoltaic installation is not producing. It is one of the reasons why the council considered sharing this energy with the "Concejo de Esparza" local neighbours.

In order to share energy, the council has created the "Esparza Energy Community" in which the council and interested residents and companies of Esparza, with electricity consumption points, participate in a voluntary and open participation process.

With this model, self-consumption of close to 100% is achieved, since the distribution of production among all the attached USPC (universal supply point code) results in a lower quantity close to the latent consumption of all households. This circumstance and the fact that most of the generation is carried out during peak hours, means that the economic profitability of the investment allows the return in a minimum period of years and, thanks to the agreement established in the Energy Community, both the council and the neighbours are benefitted.

The legal status of an Energy Community is not clearly regulated, so this Community has been constituted in fact by means of an agreement signed by all the members.

The agreement specifies the economic distribution of the benefits derived from the installation.

Below a comparison table between European regulations and this project is shown:

	REDII	IEMD	Esparza
Legal entity	Yes	Yes	Yes
Members	Natural persons, local authorities, including municipalities, SMEs	natural persons, local authorities, including municipalities, small enterprises and microenterprises	natural persons, local authorities, including municipalities.
Locational limitation	Yes (local proximity)	No	Yes (local)
Type of energy	All RES	Electricity only	Solar energy
Purpose	provide environmental, economic or social community benefits for its shareholders/ members or the local areas where it operates rather than financial profits	provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits	provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits
Electricity sharing	Yes	Yes	Yes
Imbalance responsibility	Yes	Yes	Yes
Non-discrimination	Yes	Yes	Yes
Market Access	Yes	Yes	Yes
Consumers protection	Yes	Yes	Yes
DSO status	n.a.	Member States may allow the DSO status	n.a.

Table 7

4.4 Comparison among projects

Several similarities have been found in the development of RES in the three countries:

Renewable energies have experienced strong growth in recent years, largely due to supportive policies that drive their development.

- ✦ These RES promotion policies have been mainly aimed at the electricity sector, so the percentage of renewables in electricity consumption has grown more, compared to the percentages of renewables in other uses (heating/cooling and transport).
- ✦ Wind and solar photovoltaic are the technologies whose installed power has increased the most
- ✦ In none of these three cases is there a specific definition of the energy community, therefore, each case is specific and complies with the regulations that best favour it.

However, despite these similarities in the evolution of RESs in the three countries, there are enough differences in the regulatory framework to support RES, as well as in the evolution and characteristics of SEC.

It is clear how in Germany and Denmark there is generally a trend towards larger projects, supplying large cities or several towns or regions, with the interference of banks, apart from the states themselves and the inhabitants of the area, due to their high costs. On the contrary, in Spain the trend is towards smaller projects of individual neighbourhood communities or villages. This is due to the fact that the Spanish regulations in this area are very recent, and all these types of projects are beginning to be installed, while in Europe this type of projects have been proposed for several years.

It is clear how in Spain so far the facilities are owned by energy communities made up of neighbours, without creation of a shares market, while in Europe the property is usually distributed between banks and energy communities, where shares have to be bought to become a participant.

5 Navarra´s strengths

Navarra is a pioneering region in renewable energies as there are headquarters for leading companies in the sector that are dedicated to the implementation of renewable energy, as well as developing outstanding projects in this sector.






Furthermore, both the regional administration and local administrations are making a firm commitment to measures to boost the implementation of renewable energy in the Navarra region. For this purpose, there are specific help lines.

On the other hand, and a very notable factor, there is great social awareness among the population regarding the consequences of climate change and the need to act urgently to change the current energy model. We understand that citizens want and should be an active part in this end.

6 Barriers and possible solutions

One of the factors why these projects have been developed less in Spain, apart from the importance of current regulations, is that, according to the International Monetary Fund, there are fewer people in Spain with the economic capacity to invest.

Therefore, lately there is a tendency to promote photovoltaic installations. Because they are very efficient installations and their cost is lower than other technologies, a significant increase has been seen in the number of photovoltaic cooperatives. This number has recently increased due to the regulatory change due to RD 244/2019, removing the so-called “Sun Tax” in Spain. Other factors that have favoured this growth are:

-  Replication of success stories.
-  Development of guides and training courses.
-  The technology is simple and modular.
-  It is easy to size the plants according to the available space.
-  City councils, churches, schools and other institutions are much more willing to provide roofs for mounting solar panels to cooperatives than to other more investment-oriented entities. Many cooperatives have taken advantage of this niche.

Navarra is a small community, with multiple urban centres not very extensive. Therefore, it will be inadvisable to propose large projects, since the costs would skyrocket and the participation of banks would be necessary. In addition, currently the regulations do not allow the consumer to be more than 500 meters away from the generator. By having more than 1,000 local entities, it would be more efficient for each of them to implant their solar garden on the roofs of public buildings in the municipality, in order to supply this energy for the electrical expenses of the municipality and its own neighbours.

Another great problem not only in Navarra but also at the European level is that there is a great legal problem, since, in current regulations, there is no definition or legal figure for energy communities and cooperatives. Because of this, each of them must adapt as best as possible to existing legal figures, this makes each case different, depending on the characteristics and needs of each project, and it makes it difficult to adapt to regulations, complicating their constitution.

Finally, it has been verified that there is currently a major problem in access to distribution grids by companies in the sector. These companies put many obstacles, taking advantage of the lack of specific regulations, because these cooperatives or electricity communities do not benefit them economically. To solve this problem, each energy community is working to develop an agreement, which must include all the participants in the project and their own energy distribution among them. These agreements are not standard, but each cooperative must write its own and negotiate with the distributor, which currently has the right to deny access to the grid.

7 Conclusion

In Spain, the number of renewable energy generation facilities and the percentage of renewables in consumption have increased significantly, especially in the electricity sector. The growth of renewable electricity has been mainly due to economic incentives. However, unlike in Germany, very few power generation plants are in the hands of SECs. In general, energy-related activities are in the hands of large construction or energy business corporations.

It would be interesting to implement in Spain, and specifically in Navarra, a series of measures that would facilitate the implementation of energy communities.

To begin, the definition of an energy community should be specified. Currently, these SECs have to conform to other definitions, not solving their specific problems.

As in Germany and Denmark, it would be interesting if there were a series of incentives and aids to make these communities competitive with large electricity companies and thus facilitate access to grid for small producers and consumers.

It would be interesting if there is a law that forces large utilities to provide hourly consumption data and all the information necessary for the feasibility study of a self-consumption project and for its subsequent monitoring, since this data, when it is processed, takes a long time to arrive or never arrive, making it difficult for the project to proceed smoothly.

In the current legislation, great progress has been made in facilitating individual self-consumption and collective self-consumption, but it needs a series of improvements to facilitate the entry into the market of energy communities and, therefore, continue to advance in energy change.



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The project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement n°785045.

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