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Energy Democracy, Energy Communities and the Greek Legislative Framework

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Energy Democracy, Energy Communities and the Greek Legislative Framework

Abstract

The transition from conventional energy sources, such as coal and diesel, to renewable energy sources is essential in the midst of a global climate crisis. A vital step towards this direction is the adoption by the United Nations of the 2030 Agenda for Sustainable Development, which consists 17 Sustainable Development Goals (SDGs) aimed at safeguarding the sustainability of Earth and humanity while promoting democracy and green growth for all. The electricity market is constantly evolving and this evolution should enable citizens to generate and consume their own energy. The only way to achieve that during the energy transition is to establish energy democracy and set up energy communities.

Energy democracy is a relatively new concept for which there is no precise definition yet, as it started being referred to in academic articles since 2010. Energy democracy is a notion that ensures access for everyone to adequate energy, elimination of energy poverty, generation of energy in ways that do not harm or pollute the environment, as well as regulation of production, distribution and consumption of energy in a collective, political and public form. The issue of energy poverty, which has also emerged relatively recently, is featured in studies presenting a wide variety in energy poverty rates between European Union countries even today. At the same time, while in the Western World access to modern energy services can reach 100% even in rural areas, developing countries, such as those in Sub-Saharan Africa, face serious energy deficits in remote and rural areas. A suitable solution for this issue is the establishment of autonomous renewable energy systems, which will reduce the connection cost to the main power network.

Energy communities are an institution that empowers its members to produce the amount of energy they need to consume (prosumers), upgrade the community's status, actively contribute to the energy transition process instead of being plain observers, fend off energy poverty and lack of access to modern energy services, and promote energy democracy and gender equality. The cited references to energy communities from around the world showcase how they operate, as well as their role in local communities and the energy transition process.

The purpose of this dissertation is to present and thoroughly examine the institutional framework in Greece regarding the establishment of energy communities and whether it follows the European Union's proposals for encouraging the participation of citizens in the energy market and the energy transition process, in order to achieve the energy and climate goals set by European institutions. The multitude of bureaucratic and financial obstacles that hinder the development of energy communities in Greece, as well as the issue of gender inequality within the communities are also prominently featured. In conclusion, proposals and solutions regarding the orderly operation and development of energy communities in Greece are presented, as well as the need for advocating in favor of laying the foundations of energy democracy. This institution will propel communities to achieve social equality and justice as well as a transition to a viable world, where citizens will produce and distribute clean renewable energy.

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1. Introduction

International treaties and agreements such as the Kyoto Protocol and the Paris Agreement set emission reduction targets and increase the share of renewable energy sources in the energy mix of each country with time constraints in a multitude of countries participating in these treaties and agreements and which play a very important role in the global energy and emissions map.

In this transition period of the energy sector, we are forced to invent new ways of organizing and acting, or copying brilliant examples of other countries, so that we do not remain a cog in the wheel in this fast-paced technological and social development of Western civilization.

We are in the midst of a global climate crisis. The devastating effects of climate change are now being conspicuous around the globe. Therefore, the energy transition to renewable energy sources is a necessity acknowledged internationally to address the phenomenon of climate change. The objective of reducing the average global warming below 2 ° C to 1,5 ° C set by the Paris Convention in 2015, seems even optimistic. According to United Nations Environment Program (UNEP) the emission cut targets posed in November 2016 by the member states of the Paris-Agreement will result in temperature rise by 3 °C above pre-industrial levels, far above the 2 °C of the Paris climate agreement, while one of the most polluting countries' president, United States president Donald Trump, announced on June 1, 2017, that the U.S. would cease all participation in the 2015 Paris Agreement on climate change mitigation. Some countries pose the profit of a specific industry above the commonweal.

Consequently, the European energy market is being transformed from two different views. On the one hand, the energy production based on fossil fuels and nuclear power loses its dominant position with an expeditious rate by the green, eco-friendly, perpetual, renewable energy. On the other hand, the large national utilities that dominate the centralized markets give their place to a decentralized market's system based on giving merit to the energy production and supply by the private sector. Except for the latter, there is the perspective that gives power to the people creating active energy citizens called prosumers, citizens that are able to produce and consume their own energy. This perspective can give to this revolutionary transition a democratic character which is going to be analyzed afterwards.

Given the situation described above a very important issue raises, that of democracy. Without framing specific policies that promote the common good and civic participation in a social good, such as energy, problems that threaten humanity will continue to exist, or even create new: climate change, deterioration of public health, water pollution and energy poverty.

Furthermore, this concept is inseparable with the 2030 Agenda for Sustainable Development adopted by the United Nations' General Assembly in September 2015 which includes 17 Sustainable Development Goals (SDGs). Expediting the concept of democracy, this Agenda emphasizes a holistic approach to achieving sustainable development for all. The 17 SDGs are: "No Poverty, Zero Hunger, Good Health and Well-being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable and Clean Energy, Decent Work and Economic Growth, Industry, Innovation and Infrastructure, Reduced Inequality, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, Peace and Justice Strong Institutions and Partnerships to achieve the Goal" (United Nations, 2015).

In these 17 goals are summarized the objectives for the sustainability of the Earth and humanity while promoting democracy and green growth for all. Not for a specific part of citizens, nor for specific economically developed countries. It is noted that at least one third of the targets are directly related to energy and climate policy to be pursued at international level.

According to Sweeney "*an energy transition can only occur if there is a decisive shift in power towards workers, communities and the public - energy democracy. A transfer of resources, capital and infrastructure from private hands to a democratically controlled public sector will need to occur in order to ensure that a truly sustainable energy system is developed in the decades ahead"*. Sweeney strongly believes that the only feasible way to change the energy system is the energy democracy. Energy democracy can offer a real transition to 100% RES production with zero emissions while protecting the workers' rights, providing decent and stable jobs, and ending the energy poverty in global level. (Sweeney, 2012)

Over the last decade, beyond the phenomenon of climate change, we have had to deal with a global economic crisis that began as a financial crisis and ended up turning into a deep social crisis by exacerbating social inequality and eliminating the middle class in Greece and in other European countries. The economic crisis and rising inequalities have raised the problem of energy poverty. The Sustainable Development Goals of 2015 recognize access to energy as the 'golden thread' that weaves together with human development, economic growth and sustainability. According to the results of the IEA study, until 2017, 1.1 billion people have no access to electricity and

2.8 billion people do not have access to clean cooking while women spend more than 5 hours each day gathering wood and cooking on polluting stoves associated with 2.8 million premature deaths every year. (Daly, 2017)

According to Objective 7, therefore, it is sought to ensure universal access to modern energy services when one in five people does not have access to them. In addition, Objective 5 explains, among other things, that "gender equality is not just a fundamental human right but also a necessary foundation for a peaceful, sustainable and prosperous world" (United Nations, 2015). There is an inextricable link between access to energy and gender equality. Men and women are affected by the lack of access to modern and sustainable forms of energy. But the socio-economic conditions and inequalities and gender-specific roles defined by outdated social conventions, influenced by patriarchal times, phenomena that are not only observed in developing countries but also in Western civilization, often result in women suffering from a disproportionate lack of energy access. (Daly H. &., 2017)

In Greece, although renewable energy production has increased in the last 10 years, it has not reached its full potential. The result of the fallacious priorities of its energy policy and strategy is the steady support of domestic lignite production, ignoring the devastating effects on the environment and the permeability of its reserves, and the expectations cultivated in the extraction of underwater and montane regions' hydrocarbons. But there is also an aspect of reality in Europe that cultivates a sense of optimism about the future and that is going to facilitate the transition to green renewable energy. "It is the movements of the citizens who are taking the issue of energy into their own hands, claiming and imposing another model of energy development, more equitable, more economical and more secure, while at the same time benefiting themselves and their local communities the multiple benefits. " Energy communities have been developing for many years in most European countries, while in Greece, energy community was only legalized in 2018 by the Law on "Energy Communities", attracting a large number of stakeholders, municipalities and citizens. "Energy Communities, as collective local groups, focus on citizens, and based on their democratic model of functioning, their local character and emphasis on meeting needs rather than on maximizing profits, they have the prerequisites to function as local social resilience and sustainability providers, providing multiple social, economic and environmental benefits on the condition that there will exist the necessary support from the state" (Heinrich Boll Stiftung Institution, 2019).

The purpose of this thesis is to highlight the need for further study of energy democracy, its relation with the promotion of energy communities in Greece through studies and examples of other European countries, and globally, and their role in the Agenda 2030 on Sustainable Development adopted by the United Nations with the 17

Sustainable Development Goals (SDGs) set. Moreover, this qualitative document analysis is going to give prominence to the problem of the energy poverty and the limited access to modern energy with the potential solution of the energy cooperative schemes and specifically the energy communities. In conclusion, there will be analyzed Greece's legal framework for energy communities while proposals will be presented in order to incorporate EU directives to strengthen the role of citizens in the energy transition, the promotion and development of energy communities, and finally to empower energy democracy, tackling of energy poverty and gender equality through the institution of energy communities.

2. Energy Democracy

2-A. The meaning of Energy Democracy

Energy democracy is a rather new concept. Searching academic articles someone can find references after 2010. There is no exact definition. The word democracy is usually used to describe the processes and the mechanisms associated with decision making. According to Barry democracy is defined as "the procedure for capturing the views of citizens and translating them into outcomes" (Dowding, K., Goodin, R., & Pateman, C., 2004). As far as energy democracy concerns there are some definitions to the point with whom the book "Energy Democracy: Germany's Energiewende to Renewables" begins: "*Energy democracy: 1) when citizens and communities can make their own energy, even when it hurts energy corporations financially; 2) something currently mainly pursued in Denmark and Germany but that can spread around the world during the current window of opportunity; 3) the most often overlooked benefit of distributed renewables in the fight against climate change; 4) something to fight for as the path to better quality of life with stronger communities and better personal relationships*." (Craig Morris, 2016)

''Originally the term 'energy democracy' arose out of the climate justice movement. The Berlin-based group Gegenstrom describes energy democracy as a concept capable of integrating energy and climate struggles. It is grounded on the basic understanding that "the decisions that shape our lives should be established jointly and without regard to the principle of profit." (Gegenstrom, 2012) The Klimaallianz Osnabrück movement emphasizes the importance of participatory forms of decision-making. It demands de-centralisation and independence from corporations, distribution grid use rights and control over municipal energy suppliers, moderated forms of reconciliation of interests, and union co-participation. The 2012 Lausitz Climate Camp reached a consensus that unified these ideas: "Energy democracy means that everybody is ensured access to sufficient energy. Energy production must thereby neither pollute the environment nor harm people. More

concretely, this means that fossil fuel resources must be left in the ground, the means of production need to be socialized and democratized, and that we must rethink our overall attitude towards energy consumption" (Büro für eine demokratische Energiewende).'' (Conrad Kunze, 2014)

Society is often presented simply as a source of demand and it is not taken into account that power plants also belong to society, which means that we have co-ownership. At the same time, when discussing security and risk, society is presented as a host of policies decided and implemented by the national government (Itay Fischhendler, 2014), (Szulecki, 2017). In this way very important issues such as energy poverty, air pollution and climate change are not taken into consideration even though they endanger the security of individuals. «Insofar as experts understand policy to be its technical core, citizen input will remain a secondary, inferior contribution» (Fischer, 2000). In some cases, democracy can be characterized as problematic for policy planning and transition management (Hendriks, 2009), (Szulecki, 2017) .

The authors Conrad Kunze and Soren Becker in 2014 have developed furthermore the concept of energy democracy in order to compose a more precise academic definition. They accomplished that by splitting the energy democracy into four separate areas: democratization, property, surplus value production and ecology.

DEMOCRATISATION

Many see democracy as something we should strive for and not something we have already achieved. Practices aimed at widening the scope of democracy abound and almost always include the demand for democratization of the economy. There are structures that contribute to greater participation in energy policy. Examples are people in their respective regions deciding on wind farm projects, consumers deciding their municipal energy supplier's pricing policy, or members of associations deciding how to use their cooperative's profits. At best, the largest number of people directly affected by a project should have as much initiative and decision-making power as possible.

PROPERTY

Energy production affects everyone, whether they are energy consumers or residents of a particular area. Also, the technical infrastructure of the power grid requires close cooperation. Therefore, the production, distribution and consumption of energy should be regulated in a *collective*, *political* and *public* form and not in today's *individual*, *apolitical* and *private* form. How could it be structured? It is not preferable to look at the apparently simple solution of returning to conventional government units. Many public companies have also lost and politically jeopardized the energy transition. They do not offer invoices for social energy and prefer to invest in nuclear or coal. At the Community level is the additional problem of privatizing many municipal energy suppliers, often against the will of

the local population. A new form of public and state ownership should overcome these weaknesses. That was the goal, and basically two solutions were often found: new forms of municipal or sometimes semi-state ownership and collective private ownership, often in the form of cooperatives. While energy cooperatives are already widespread in some countries, the concept of a new form of public ownership is still in its infancy, with weaknesses even in the legal framework.

SURPLUS VALUE PRODUCTION AND EMPLOYMENT

Municipal wind turbines and solar panels (or those belonging to consumer groups) only need to be purchased once. As the sun and the wind are free, they produce energy at no extra cost for many years. Unlike fossil-fuel fired plants, there is no constant outflow of capital to pay for imported fuels. As a result, the capital is maintained in the area and can be used differently. Public renewable energy production is, in this sense, an advantage for local surplus production. In addition, the expansion of renewables has created more than a million job opportunities in the EU. In Germany, the renewable energy sector employs more people than the entire fossil fuel industry. Jobs are mainly developed in industrial centers, wind turbines and solar cell factories, and usually in medium-sized urban businesses. Rural areas tend to benefit more from investing increased revenues in various public services.

ECOLOGY

As is well known, capitalist economies escape the threat of crisis only through growth. The price for it is high, however, because growth ultimately destroys the basis for human life on earth and life in general. In contrast, there is the concept of post-development that prioritizes people and the planet over capitalism. This concept implies the need to consume less electricity and heating (energy efficiency) and to assess self-sufficiency as a new form of good life. Democratic ownership supports such an approach because it creates space for goals other than unilateral maximization of profits. This is when consumers, for example, organize and manage their own needs for heat and electricity by themselves: the logic of meeting needs is quite different from the logic of maximizing profit. This could be one way to reduce overall energy consumption while at the same time ending energy and fuel consumption. In addition, there is another issue worth considering: biodiversity. Wind turbines and solar farms, but mainly fields and forests for biomass production, are changing landscapes and natural habitats. Unfortunately, the cultivation of 'energy plants' reinforces the global trend towards monoculture. Technically, however, this is not a requirement; it is more a matter of agricultural policy. A socio-ecological transition should not regard the preservation of animal and plant species and landscapes and ecosystems as unnecessary luxury.

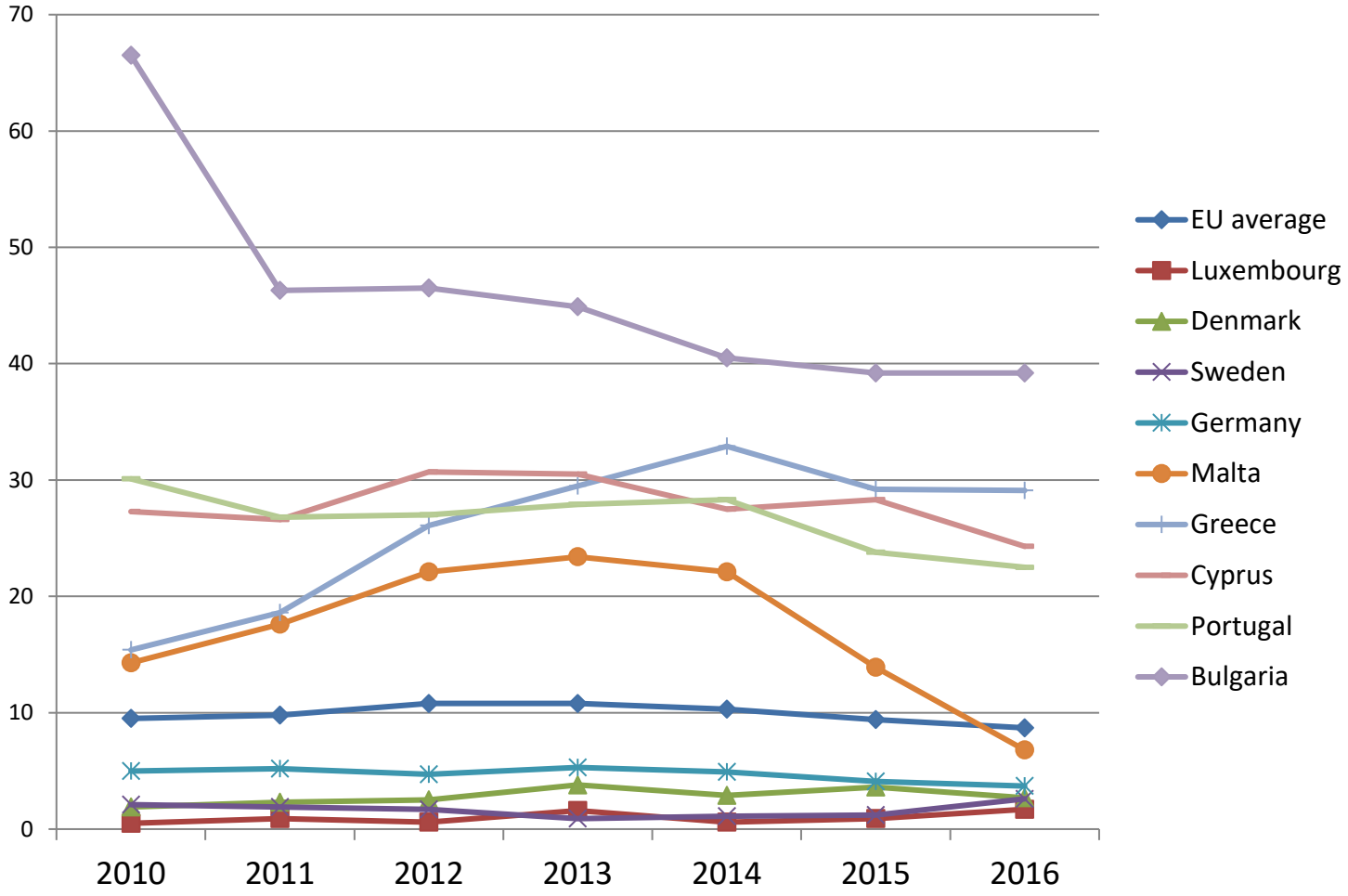
After presenting the multi-dimensional meaning of energy democracy, to understand the reasons why SDGs are an integral part for the sustainable and equitable future of the Earth and humanity it's important to designate and provide data about the energy poverty and access to modern energy services now and in the near past.

2-B. Energy Poverty in EU and Greece

The first major publication that describes the energy poverty as a social problem in an EU country dates back almost 30 years (Boardman, 1991). But only in the last decade has the issue been officially recognized at European level as a matter of EU energy policy (Bouzarovski, 2012). According to European Commission, until 2009, only four countries in Europe had adopted a definition for energy poverty; France, Ireland, Slovakia and UK (European Commission, 2009).

There are a lot of different ways that researchers and institutions define the energy poverty. The most common indicators which can show the energy poor households are the following: "inability to pay energy bills and/or debts to energy supplier(s); disconnection or threat of disconnection; disconnection as a result of perception of the need to ration consumption; health problems linked to poor housing conditions and cold related illness; housing with poor energy efficiency performance (leading to disproportionately high consumption and expenditure); diseases; cold, damp living conditions; inability to heat the whole house (may be a consequence of under-occupancy); receipt of means-tested benefits (EPEE Project, 2009). In most developed economies, energy poverty occurs when households experience inadequate coverage of their essential energy needs at home, such as heating, cooling, lighting, etc. (Bouzarovski & Petrova, 2015). However, the most definitions in the literature can be summarized in the definition: "the difficulty or inability of a household to afford an adequate coverage of its energy needs (heating comfort and other essential and modern energy services), due to high cost of energy, low household income and building's energy inefficiency, or, a combination of them. Practically, the prevalent approach to defining energy poverty in literature is that of UK, according to which a household is considered fuel poor if, in order to spend more than 10% of its income on energy. The adequate standard of warmth is usually represented as 21 °C in the living room and 18 °C elsewhere at home'' (Lefkothea Papada, 2016); (EPEE Project, 2009). In **Figure i** are presented, according to Eurostat, the percentages of households that were unable to keep the house sufficiently warm from 2009 to 2018 in the European Union and Greece.

***Figure i*- Percentage of households' inability to keep home adequately warm**

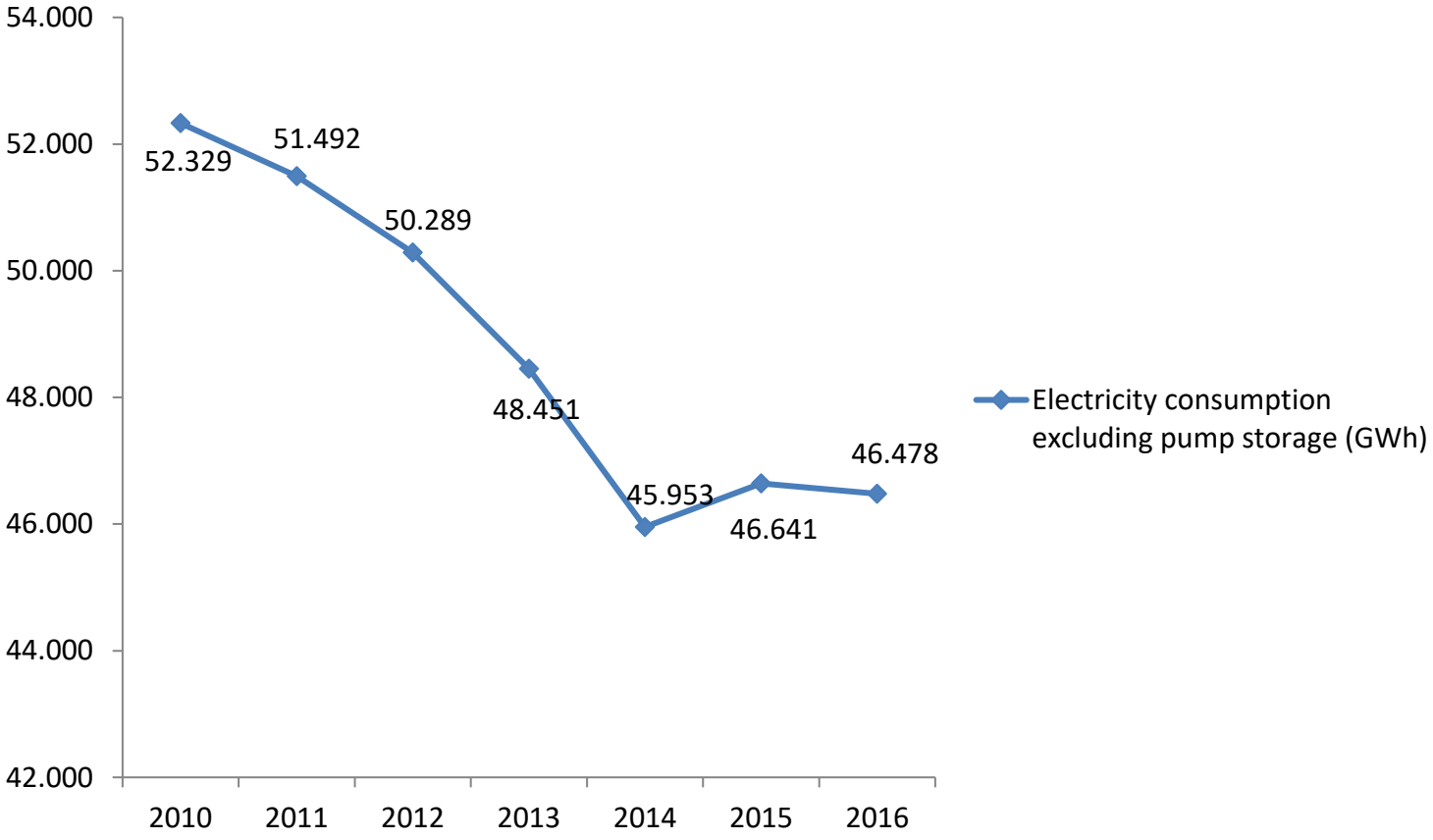


(Eurostat, 2019)

Figure i demonstrates that European Union has been operating in two different realities. Countries like Denmark and Luxemburg enjoy significantly low indexes of energy poverty as long as other European countries, such as Bulgaria, Portugal, Cyprus and Greece have been plagued by the energy poverty malady. The financial crisis has basically affected most of the Mediterranean states and New Member States. In addition, it affected some other states such as England and Ireland, as well as Malta. A. Dagoumas and F. Kitsios in their analysis of the impact of the economic crisis on Greece's energy poverty prove that the economic crisis was a major factor in reducing electricity consumption and in the ability of people to pay their electricity bills, while the policy adopted by the government, the decision to put the property tax on the electricity bill has met with strong opposition from citizens and political parties. It later adopted some of RAE's proposals which had social characteristics, especially in periods of extreme weather. The largest decreases in electricity consumption are observed in the two major urban centers, Athens and

Thessaloniki. The financial crisis has a major impact on power consumption (Figure ii) and the ability of consumers to pay their bills, resulting in PPC acquiring liquidity problems by increasing consumer debt to PPC. This creates a number of impacts on the whole market, affecting the liquidity of producers, the Natural Gas Corporation DEPA, the natural gas importers and transmission operators with the very serious risk that the major socio-economic problem of energy poverty will become a major energy security problem. (Dagoumas, 2014).

Figure ii- Electricity consumption excluding pump storage (GWh) in Greece



(Regulatory Authority for Energy (RAE), October 2017)

Energy cooperatives play a very important role in highlighting and tackling energy poverty. They promote energy democracy through collective processes and the way they are organized, as we will see later in more detail and provide energy to community members. Generating and promoting the use of RES energy locally (electricity, thermal or cooling energy) can make a significant contribution to tackling energy poverty (Korovesi Alice, 2017). The members of energy communities are able to meet energy needs on their own,

fight energy poverty and create jobs without waiting for the state or private investors to do it for them. (Heinrich Boll Stiftung Institution, 2019).

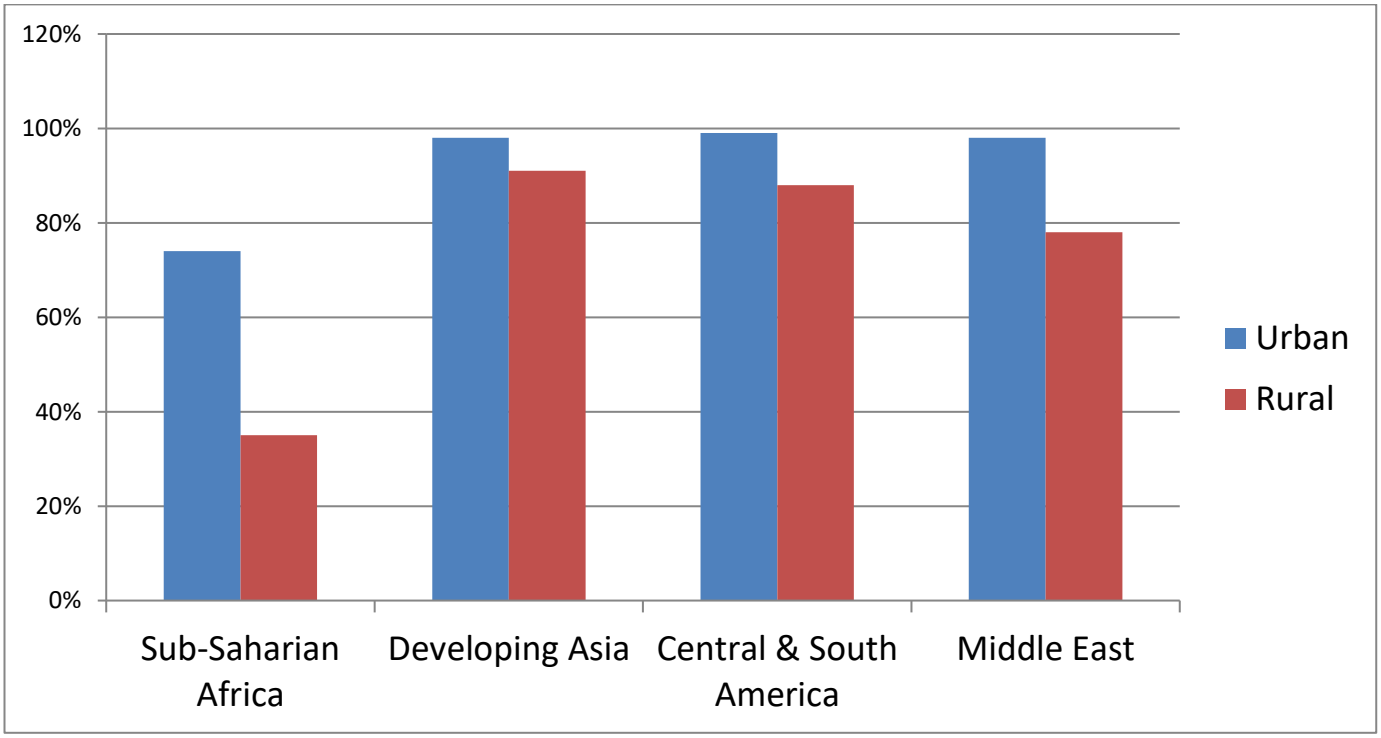
Providing energy at lower prices and addressing energy poverty are important benefits of energy cooperatives. The cooperative supplier Ecopower in Belgium, has been acknowledged as having the fairest billing structure of all the suppliers in the Flemish region. Moreover in the UK, in order to address fuel poverty in Brixton, cooperatives provide “low-cost” or “free electricity allowances” to their members (Community Power, Friends of the Eearth and REScoop, 2020). “In addition, cooperatives allow consumers to choose where their energy comes from and encourage them to install RE generators or undertake energy efficiency measures” (Community Power, Friends of the Eearth and REScoop, 2020). In Greece, the recently adopted energy communities law defines ‘energy community’ as a ‘cooperative solely aiming at promoting social and solidarity-based economy and innovation in the energy sector, addressing energy poverty and promoting energy sustainability, generation, storage, self-consumption, distribution and supply of energy as well as improving end-use energy efficiency at local and regional level’ (Greek Ministry of Energy, 2018). UK Repowering London is a not-for-profit organization that supplies renewable energy while also financing energy efficiency measures and combating energy poverty among its customers. Through solar energy projects in social housing in Brixton, the organization feeds part of its electricity to the grid benefitting from feed-in tariffs. The rest of the electricity is provided to the housing estates at discount prices in order to address the energy poverty of the inhabitants. In addition, 20% of the total net profits are invested in the Community Energy Efficiency Fund (CEEF), which promotes and finances low-cost energy efficiency measures (REScoop, 2020). The project Energie Solidaire was presented in 2014 by Friends of the Energy Cooperative (Les Amis d'Enercoop). They presented an innovative system of financing local energy poverty reduction initiatives. The program collects small donations through energy bills to support local initiatives aimed at reducing energy poverty. So far the program is supported by the 30,000 customers of the Enercoop energy cooperative, but soon the system will expand to give other providers the opportunity to participate. This will significantly help increase donations, thereby funding more initiatives. The next goal of Energie Solidaire is to create a collaborative platform where those who have benefited will donate an amount that comes from energy savings so that this money can be invested in other projects and especially in needy households (Korovesi Alice, 2017).

2-C. Access to modern energy services

“Energy democracy means that everybody is ensured access to sufficient energy” (Conrad Kunze, 2014). In 2014, 1.06 billion people lacked access to electricity - about three times the population of the United States. This was an exiguous improvement in relation to 2012, when 1.1 billion people lacked access to electricity. The share of the global population with access to clean fuels and technologies for cooking rose over 2012-2014 from 56.5 to 57.4 percent. But due to population growth the absolute population lacking access to clean cooking grew from 3.03 billion to 3.04 billion over this period (Sustainable Energy for All, 2017).

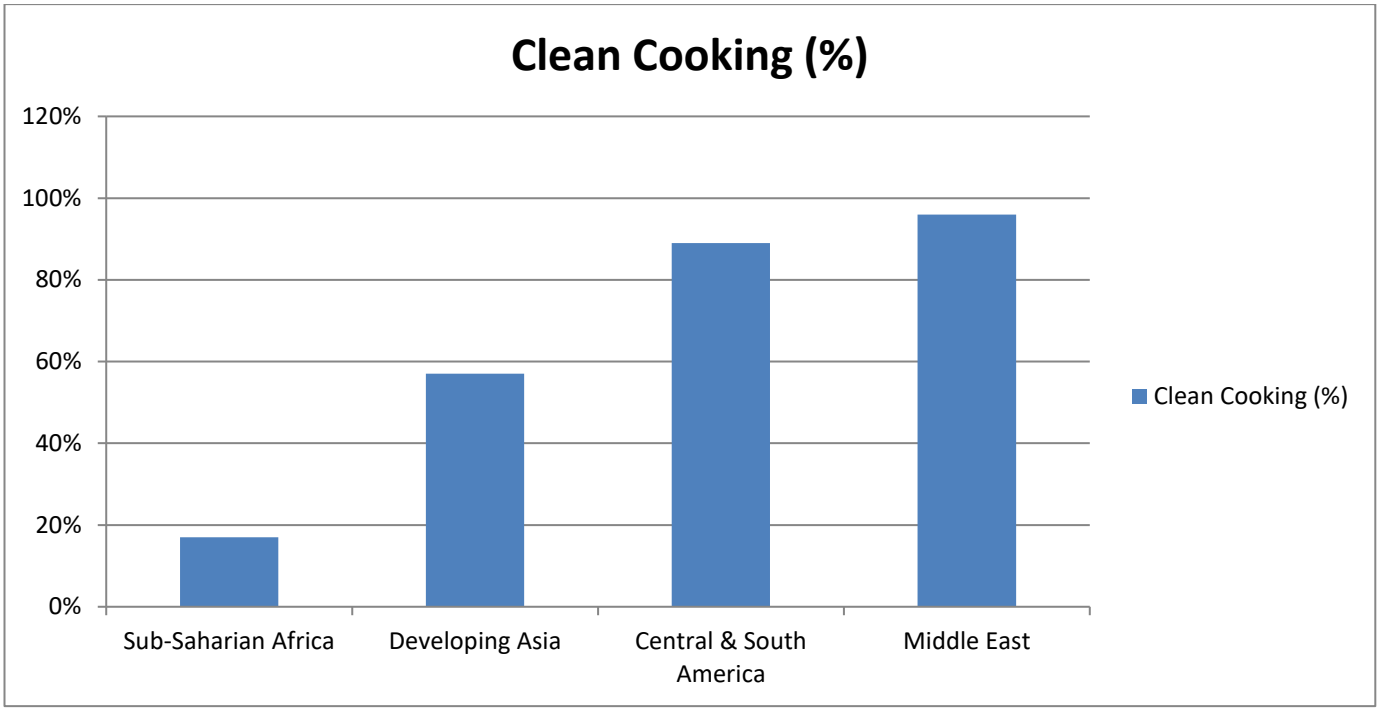
We saw previously that as far as energy poverty concerns, EU has countries that have exiguous ratings of energy poverty and others, like Bulgaria, that have a huge fuel poverty problem and cannot keep their homes adequately warm. In Figure iii is demonstrated the electricity access in the developing world. Similarly to what happens with energy poverty inside EU we see that there is a huge problem in Sub-Saharian Africa, especially in rural areas, while in western civilization the electricity access rates run to 100% even in rural areas. The same can be observed in Figure iv where the clean cooking rates in Sub-Saharian Africa are diminished in relation to the other developing areas, It is even lower than 20%. There is no reason to engage with developed countries such as European countries or North America, as their percentage of population having access to modern energy services nudges the 100%.

Figure iii - Electricity Access in Developing World



(IEA, 2019)

Figure iv - Clean cooking in Developing World



(IEA, 2019)

Demand for electricity in developing countries is high in both urban and rural areas. But limiting financial resources makes it difficult for energy planners to provide the required amount and quality of electricity, thus setting specific priorities. The prevailing theory in developing countries was the model of centralized electricity generation and national distribution networks, which dominated developed countries over the last century, which meant that they had to expand the network. This is of course relatively easy and practicable in urban areas. Lack of access to electricity is seen mainly in rural areas, especially in sub-Saharan Africa.

If the network extension model were the only alternative these sites would be destined to continue to have the same problem for many years. Furthermore, the IEA estimates remain in the same sense of this point of view, as they estimate that 30% of these areas are better served by the expansion of the central grid. So, there are, technically, two alternative ways of supplying electricity to remote and rural areas, with difficult access or to villages and communities with a scattered population. The first is autonomous systems, which provide basic electricity services such as lighting and phone charging mainly to households. Of course they do not have the capacity to meet the energy needs of production, but they provide a first solution to the need to replace kerosene lamps etc. The solution for the excess usage of electricity in rural areas is the second alternative way, the mini-grids. It is an intermediate solution between the

centralized electricity, conventional grid connection which constitute, and the stand-alone systems. Mini-grids can be powered by diesel generators, renewable energy or a combination of both, called hybrid systems. The only challenge here is financial sustainability (capital and operational costs, maintenance requirements) – although solar energy for instance is one of the most economic ways for a mini-grid project to lower its costs after the recent decrease in solar photovoltaic (PV) panel costs. According to IEA's estimations in order to ensure universal access to electricity by 2030, the 40% of the new required capacity will originate from mini-grids (Fuad Siala, 2016). Despite the financial sustainability challenges, Renewable Energy mini-grids can more reliable in providing energy access to the local community. Below, in Table I, are featured the advantages of RE mini-grids compared to central grid extension:

Table 1 - RE mini-grids advantages

RE mini-grids advantages for reliable and affordable access compared to central grid extension
lower capital expenditure for infrastructure
lower operational expenditure by avoiding transmission and distribution losses
in regions with power deficiency Re mini-grids can be more reliable in providing energy access and guarantee the local energy security
mini-grids can be implemented more expediently and avoid the bureaucratic hurdles of the central grid extension
compared with other decentralized electricity production options such as solar home lighting systems and off-grid lighting products, mini-grids can also provide electricity to commercial loads further to residential loads
the development and operational part of mini-grids can conjure more jobs for the local people

(Carvallo, 2016)

Mini-grids are anticipated to contribute a lot in appeasing the energy poverty issue in rural-areas worldwide. Community owned RE mini-grids can bring additional benefits for local development: i) they may ameliorate the social attitudes towards RE technologies, ii) they improve the energy reliability and alleviate the costs, iii) they augment the local income generation, iv) they empower the community and v) they expand the local capability which means that system technical sustainability can be maximized and contribute to new projects in other sectors (water, education, health etc.). (Rolando Madriz-Vargas, 2015)

3. Energy Communities

3-A. The meaning of Energy Communities

Although there is no strict definition of "energy democracy", we have already attempted to approximate the concept of energy democracy, "it relates to the shift of power in all aspects of the energy sector (from production to distribution and supply, from financing to technology and knowledge) to consumers and workers, with an increased emphasis on social and environmental goals. This growing 'Community power' enables citizens to become more involved in the production and use of sustainable energy and to contribute to the EU's energy transition. Community power can support the transition to low-carbon energy systems as it leads to adoption. Sustainable energy policies ensure that RES projects benefit from public support and acceptance and contribute to energy self-sufficiency. In addition, community power and local energy projects can enable communities to utilize local resources, build social capital, create employment, generate income and economic benefits. (Mariya Gancheva, 2018)

Such community-led initiatives based on local collaborative solutions that allow the development of sustainable energy technologies are increasingly recognized as key potential players in the transition to low-carbon energy systems. Therefore, the proposal for common rules for the internal electricity market recognizes the important role of these initiatives and provides a definition of a 'local energy community': “An association, a partnership, a non-profit organization or other legal entity that is substantially controlled by local shareholders or members, is generally of value for profit and participates in the distributed production and activities of the manager, supplier or

concentrator the distribution network locally, including cross-border. " (Mariya Gancheva, 2018)

Classification

There are various ways to categorize energy communities. The first way to differentiate was to differentiate by answering the question "from whom?" and it was about whether the partnership would be participatory or institutional, and to another question "for whom?" which was about whether it would be collective or private (Gordon Walker, 2008). Van Der Host considers the important role that the various activities of social enterprises can play in the development of RES, thus distinguishing seven types of business and consumer activities that social enterprises can pursue (Horst, 2008). Bronin and McCary identify five possible micro-system configurations for energy communities, taking into account the following variables:" the number of end users, the number of parcels served by the microgrid; the ownership of these parcels; and whether the network infrastructure crosses public roads or not" (Sara C. Bronin, 2013). Heiskanen et al. make a distinction between: "geographically local communities; sector-based communities; interest-based communities and virtual communities (Heiskanen E., 2010).

Stefano Moroni et al. consider the previous classifications as complementary to theirs. They assume a four-cell matrix which is demonstrated on the following table:

Table 2 - Types of energy communities

	Non-place-based communities	Place-based communities
Single-purpose	Their sole purpose is to produce, manage or purchase energy in accordance with common rules	Their sole purpose is to produce, manage or purchase energy in accordance with common rules
Multi-Purpose	Their purposes are to share production, management or purchasing energy-related goods and services	Their purposes are to share production, management or purchasing energy-related goods and services

In order to explain better the categories displayed in Table 2, we are going to introduce each one particularly:

i) Non-place-based communities, due to non-affiliation with a particular piece of land, enable members to participate in various and unobstructed ways. For example, groups of people could simply be involved in a larger energy project that would not be locally related to the neighborhood in which they live and work. In addition, ownership of energy equipment and infrastructure in these cases is not necessary. Therefore, non-spatially

affiliated individuals form consortia to obtain tariff advantages on specific goods and services.

ii) On the other hand, in the case of place-based communities, they are comprised of members who gathered on a territorial basis, “which varies from apartments – blocks of flats, tower blocks or skyscrapers- to city districts, to wider territorial contexts on the basis of cohabitation rules and shared local objectives” (Valentina Antoniucci, 2018). This territory, for instance, can be an expanse of land in which the community itself possesses and processes the energy resource. These kinds of communities are located in a physical way and they are defined by themselves as they belong to that specific territory and the most of the times they are called by the area’s toponym.

iii) Individuals in the single-purpose communities follow a system of rules and relationships exclusively for the purpose of managing energy production and consumption or purchase. A main and very specific and limited objective thus gives form and meaning to the community and significantly affects its structure and organization.

iv) On the contrary, in addition to energy targets in various forms, multipurpose communities also share other types of goods and services. It is evident that the presence of multiple objectives is a factor that entails greater organizational and operational complexity, a multilevel operational complexity.

Energy communities can evoke strong social implications supporting citizen’s participation in the energy system. In line with EU legislation their main purpose is to participate in economic activities other than for-profit (REScoop.EU, 2019). This kind of communities can be further determined into ‘communities of place’ and ‘communities of interest’ as they are projects run by the local community bringing benefits to itself and also have some common interest, for instance the common interest of the community in the transition of the local energy production to renewable energy (Bauwens, 2016).

A major distinction between energy communities concerns profitability. Two models that can be applied are the community-based model (for-profit) and the community-based model (non-profit). In for-profit model the majority Community participation characterizes the model and it retains control interest in the project. In Greece, members in such an energy community can be: i) at least 15 (fifteen) in case the members are legal entities under public law – except the Local Authorities, or legal persons under private law or natural persons, ii) at least 10 (ten) if it is in an island municipality (of population of less than 3.100 people), iii) 50% plus one of them are natural persons. The distribution of profits is allowed and more specifically it is allowed to distribute the balance of net profits after deducting the reserves to the members. On the other hand, in non-profit model, together with the majority community interest, the profits are not distributed among the members but are reinvested in the project. In Greece, members can be: i) at least 5 (five) in case

the members are legal entities under public law or natural persons, with shares 5 x 20%, ii) at least 3 (three) in case the members are only Local Authorities, with shares e.g. 35%, 35%, 30%, iii) at least 3 (three) in the event that the members are legal persons under public or private law or natural persons, of which at least two are Local Authorities, with shares 20%, 40%, 40%, iv) at least 2 (two) in case the members are Local Authorities in an island area with shares 50%, 50%. In non-profit community-based model profit distribution is not allowed with an exemption for islands with population of less than 3.100 people, part of profits can be allocated for local benefit actions of local character (e.g. reservoirs etc.) (PASSAGE Europe Interreg, 2019); (Tsekeris, 2018)

3-B. Examples of Energy Communities in Europe

As is well known, some forms of community, focusing on renewable energy, have long been developed in Europe. In Sweden, the Netherlands and Denmark, for example, this has been happening since the 1970s and 1980s and then in Germany, Great Britain and other European countries. Globally, thousands of initiatives are now counted as examples of energy communities (Stefano Moroni, 2019).

Energy Cooperative Companies of Ærø, Denmark

Ærø is a Danish island located in the South of the Country and it has 6.300 inhabitants. Originally there were two municipalities (Ærøkøbing and Marstal) that in 2007 were merged to one bigger municipality (Ærø) which contains the entire island. The location of this island is ideal for wind and solar energy production and the community supported a lot the renewable energy production.

The 1970s oil crises affected many citizens of Denmark. As a result, it was an urgent need for exploring alternative energy technologies, not only for the government but also for other stakeholders such as the citizens. In the 1980s, Ærø, for a short period of time, hosted the world's biggest windfarm (11 turbines, each 55 kW) financed and owned by 128 local shareholders.

The wind farm is owned and managed by a shareholder company that only inhabitants from the Ærø island had the right to buy shares when the project started and the decisions are made by the general assembly of shareholders (Busch, 2019). In order to give support to the renewable energy projects, the island's community established in 1981 the local Association Ærø Energy and Environment Office, which took the role of a local intermediary, with more than 200 local support members. The purpose of the association

is to promote renewable energy (RE) and sustainable ways of living (Aeroe Energy and Environment Office).

By 2000, 23 small wind turbines stood on the island but with the assistance of the Energy and Environment Office the community would make efforts to replace them with less but bigger turbines. So, by 2002, three big wind turbines, as shown in Picture 3, stood on the island with a capacity of 12 MW producing around 40 GWh accounting for roughly 130% of the electricity consumed by the community on the island. (Busch, Community-owned wind farm on the island of Ærø, Denmark , 2019)

Picture 1- Wind turbines on Ærø

The wind energy is not the only popular renewable energy source in the Ærø Island. The coastal town of Marstal which is located at the Eastern tip of the Ærø Island has 2.300 inhabitants and it is the biggest settlement and also the economic centre of the island. A consumer-owned co-operative has been established and it initially installed a district heating network in the 1960s. Homeowners of Marstal when they buy a house that belongs to the network in Marstal they also buy a share in the network. The most important decisions are made by the general assembly of this energy community. One of these important decisions was the solar heating system as represented in Picture 4.

Picture 2 - Solar district heating plant in Ærøskøbing

"Since 1994, Marstal Fjernvarme has gradually started transitioning to a renewable energy system. Nowadays, the company provides heat to the settlement of Marstal from 100% renewable energy sources. 50-55% comes directly from the solar heat collectors, 40% from wood chips, 2-3% from a heat pump. The heat pump takes advantage of the intermittencies in wind power production and is preferably put to work when an abundance of cheap wind energy is available. The remaining energy comes from the combustion of bio-based oil. The boiler is a co-generation burner that provides both heat and electricity. Solar heat, which is abundant in the summer months, is stored in two pit storage systems: Sunstore2 (10,000 m3) and Sunstore4 (75,000 m3)" (Busch, Marstal Fjernvarme – a solar district heating plant on the island of Ærø, Denmark, 2019).

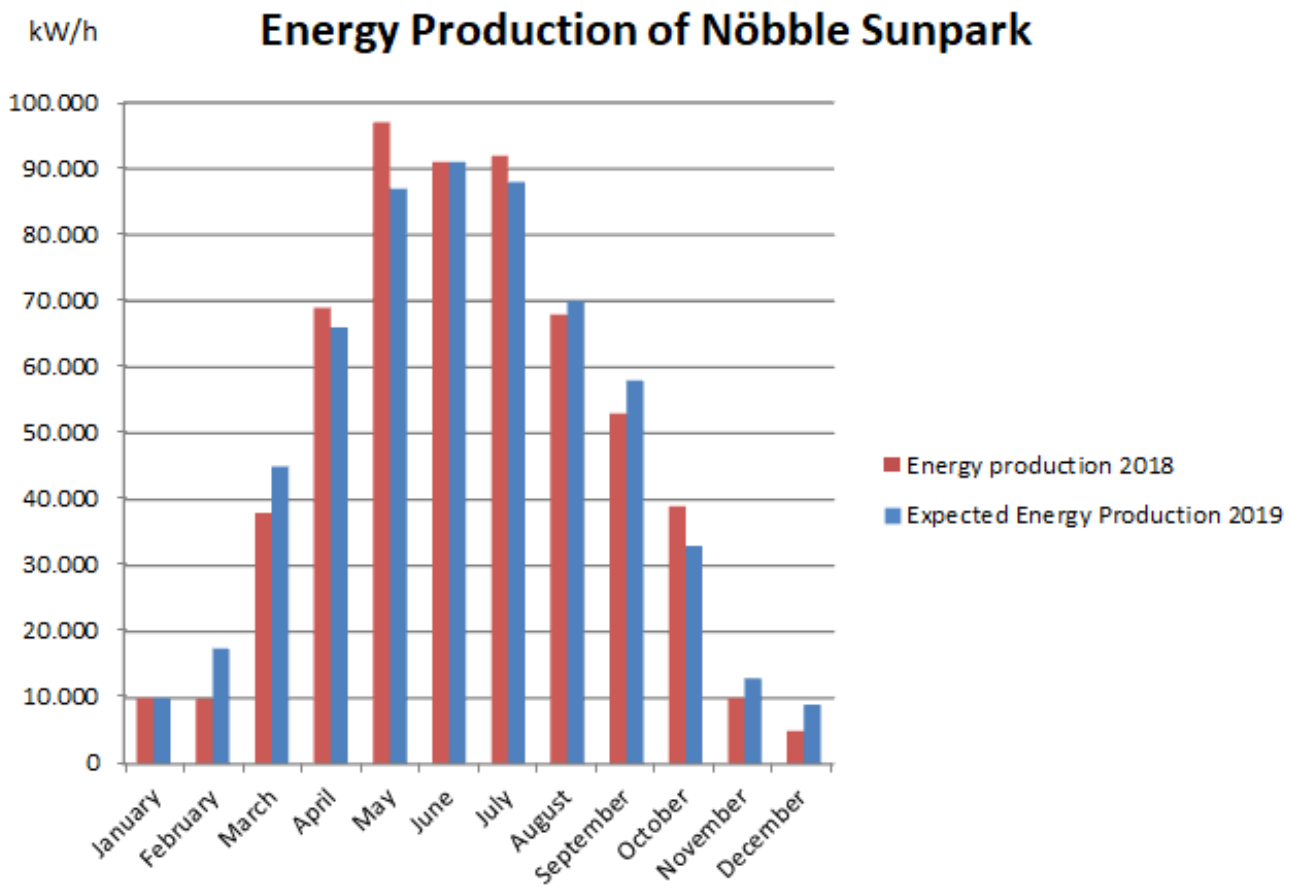
Energy Cooperative initiatives of Kalmar, Sweden

Kalmar is located in the Southeast coast of Sweden and it is inhabited by 40.000 people. The region around Kalmar is rumored to be rich in wind and solar energy. Kalmar

hosts the local energy provider, Kalmar Energi, which belongs to the Kalmar municipality by 50% and has the majority of the votes in the company's board.

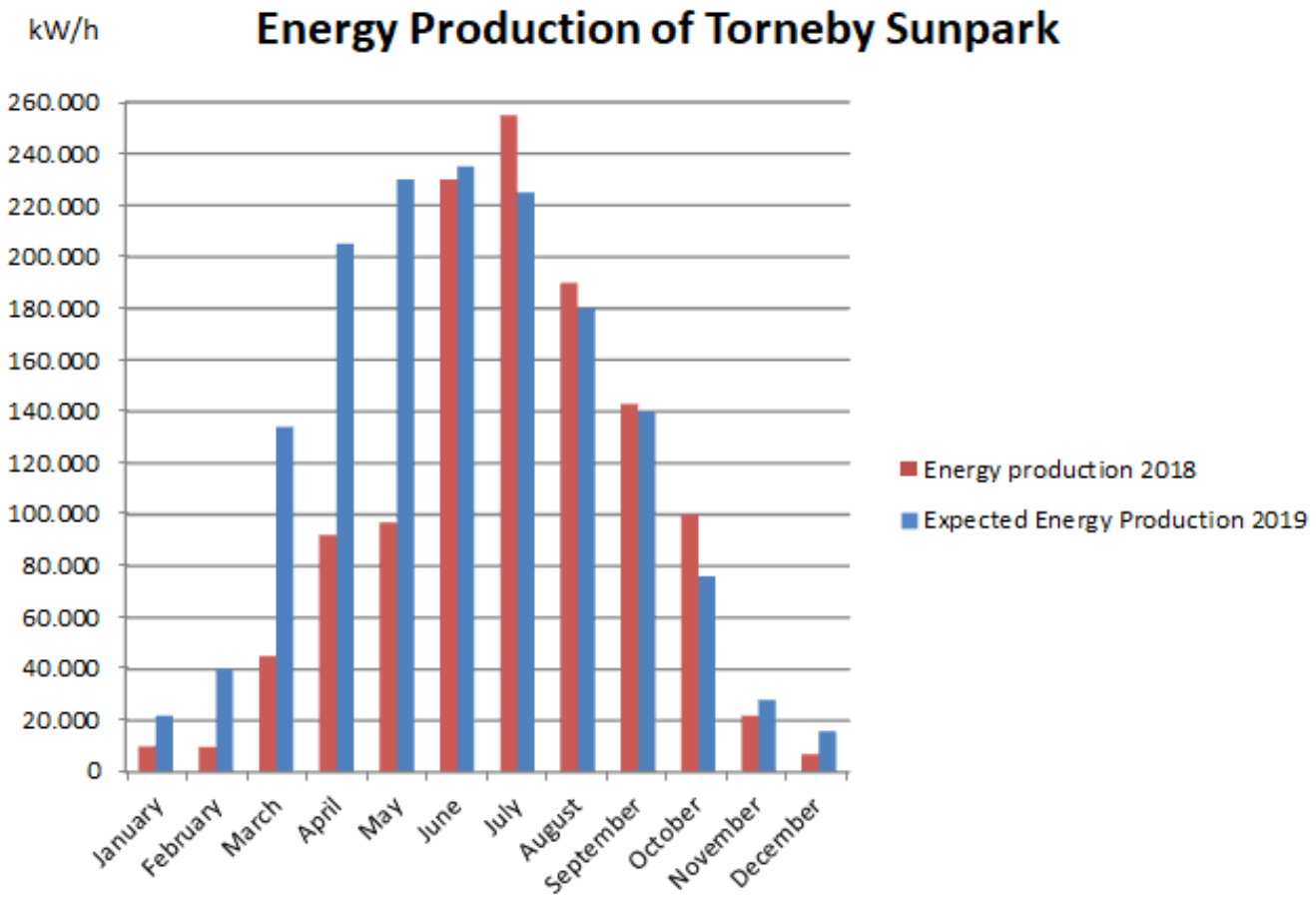
In 2006 Kalmar Energi started its first collectively-owned wind energy project. This project called would be completed with the contribution of the company's clients who were invited to buy shares of this project and form a cooperative called Kalmarsund Vind. One decade later two more projects started operating, the Nobble Solpark and the Torneby Solpark. The Nobble Solpark project originated operation with solar panels installed on the roof of a newly built barn which was an ideal location for the solar panels as it covers an area of 3.900 m^2. Its production approaches the 600.000 kWh/a (about 580.000 kWh for the year 2018 and with expectations for about 590.000 kWh for the year 2019 as they are illustrated below in the Figure v). More specifically the production for the months throughout the year 2018 was for January 10.000 kWh, February 9.900 kWh, March 38.000 kWh, April 69.000 kWh, May 97000 kWh, June 91.000 kWh, July 92.000 kWh, August 68.000 kWh, September 53.000 kWh, October 39.000 kWh, November 10.000 kWh and December 5.000 kWh. (Kalmar Energi, 2019)

Figure v – Monthly Energy Production of Nobble Sunpark (2018-2019)



The Torneby Solpark project is a larger one that followed the Nobble Solpark. It is located on land on the local airport, its surface covers an area of 15.000m^2 and its production was estimated about 1.200.000 kWh for the 2018 and expected to be about 1.530.000 kWh for the 2019 as it is illustrated below in the Figure vi. More specifically for 2018 the production variated as it follows, for January 10.000 kWh, February 9.900 kWh, March 45.000 kWh, April 92.000 kWh, May 97.000 kWh, June 230000 kWh, July 255.000 kWh, August 190.000 kWh, September 143.000 kWh, October 100.000 kWh, November 22.000 kWh and December 7.000 kWh. (Kalmar Energi, 2019)

Figure vi – Monthly Energy Production of Torneby Sunpark (2018-2019)



The decisions connected to the solar parks are managed by the multiple owners of the community projects. These owners are individual customers of the Kalmar Energi company, local companies such as the local supermarket, which own bigger shares in the parks, and public bodies such as the country administration which have also bought shares in the parks. Every owner has the right of one vote independently of the amount of its shareholding. In addition, Kalmar Energi has the role of the facilitator and technical partner, who is responsible to manage the daily operations and maintenance.

The peculiarity of the ownership structure of these cooperatives is that the model which was followed is a special prosumer model. This means that every shareholder has to be customer of Kalmar Energi. The number of shares an owner can hold cannot be more than the amount corresponding to 80% of the average annual consumption of electricity. This measure of the 80% cap prevents the take-over of the project by external investors whose main interests are financial profits. Moreover the structure of this model does not exclude customers who live outside of Kalmar, as a result a Kalmar Energi' s customer

can also be an owner of shares in the two parks. To sum up, this model indicates that people can become prosumers in a very easy way.

The two Kalmar projects are not directly beneficial to Kalmar Energi in a financial way as the investment for the two projects, although no loans were taken to finance the projects as they were financed upfront by the sale of shares, had not a high return on investment. They surely helped the company to establish a strong green local brand and to strengthen the relationship the company has with its customers. Moreover, the most important benefit of the project is the production of renewable energy and the invasion and establishment of the latter in the local society. (Busch, Törneby Solpark & Nöbble Solpark – solar PV from a local source in Kalmar, Sweden, 2019)

The Som Energia energy community, Spain

The energy community Som Energia was founded in 2010 in Catalonia, Spain. It has over 35.000 members and produces and supplies electricity to households, businesses and municipalities. More than 40 people are already working in the cooperative while many volunteers are active locally. The cooperative share that someone must pay to become a member amounts to 100 euros.

According to the president of the cooperative Marc Rosselo, many decide to become members of the cooperative, in order to contribute in practice to the development of an economy that will not focus on fossil fuels and at the same time will be based on a more democratized energy system where citizens will be directly involved. Others were dissatisfied with private providers and wanted to try an energy provider in which they could become co-owners. Many others were already involved in cooperatives in other fields and wanted to try to be active in the energy sector as well.

There are 2 sectors of acting for Som Energia, the first one is to provide clean energy to its members (Som Energia as an energy provider) and the secont one is to constantly invest in the establishment of RES energy production projects (Som Energia as a producer of clean energy. So far, the cooperative has invested in the creation of photovoltaic parks, biogas plants, hydroelectric stations, while at this stage the construction of wind farms is also planned.

Structure

The cooperative consists of different departments and local groups. Each local group is independent and has the ability to organize its own information campaigns and attract new members. The sum of the local groups constitutes the cooperative through a bottom-

up structure. Local teams can have their own operating statutes and their own priorities and procedures, depending on the needs of each area. Thus, e.g. in Barcelona the local cooperative team may focus on education, while in other areas local teams may decide that they need to implement other types of actions.

In the fall of 2016, the so-called "GrupoMotor" started developing a long-term strategy in order to expand Som Energia's participatory processes. "GrupoMotor" is an instrument created by members of the Board, members of local teams and members of the technical team, who met several times in different parts of Spain. The result of the processes was to define seven strategic lines for the cooperative and the idea to create permanent working groups in which any members will participate voluntarily and will aim to find solutions to specific problems, such as self-consumption.

The large number of autonomous local groups complicates the voting and election processes. The rapid growth of the cooperative would mean that, in order for everyone to attend the General Assembly, an entire sports stadium would be needed. For this reason, it was decided to use digital media and online tools. Local groups can participate in the General Assembly online. Thus, at the 2017 General Assembly, members could even vote online. Internet use has solved two problems: “the problem of distance” but also “the problem of organizing a meeting with a very large number of participants”. Appropriate testing and training workshops took place before the General Assembly in order to ensure that older people and those unfamiliar with digital technologies could participate on an equal footing.

Address energy poverty

To date, more than 300 Municipalities are supplied with energy by Som Energia. Som Energia also supports and cooperates with very small villages. If someone is a resident of a village with less than 500 inhabitants, he does not have to pay the 100 euros of the cooperative share to become a member. For Som Energia, someone's low income is no reason not to become a member. In cooperation with some municipalities, Som Energia helps citizens facing the effects of energy poverty. Members with financial problems have the option of not paying for electricity for one year. Also, in addition to covering the legal obligation not to cut off electricity to financially vulnerable households - something that nevertheless is not always followed by other energy providers - the cooperative prefers to work more actively and proactively to fight energy poverty in cooperation with the Municipalities. Several Municipalities have already expressed their interest in becoming members of the cooperative and paying the bill of vulnerable households. Cooperation with Municipalities in this area is important for another reason: because it allows all sections of society (especially those who are financially vulnerable) to participate in environmental protection and contribute to the transition to renewable energy sources. (Heinrich Boll Stiftung Institution, 2019), The Energy Community supports its members

and the members support the Energy Community, as there is no longer a support framework for RES, Som Energia launched the “Generation kWh” campaign where it appeals to its members to provide a zero interest rate loan, the money is used to fund new RES projects and members then can buy electricity at cost for at least 20 years. (Damasiotis, 2017)

3-C. Examples of Energy Communities in Latin America

Coopesantos Energy Cooperative, Costa Rica

There are many energy cooperatives in Latin America and a lot of them are electricity cooperatives. In Costa Rica, where the electrification rate is the highest in Central America (99.2%) and the electric bill costs 2% of the family’s annual income (the lowest rate in the region), there are four electricity cooperatives. The members of these cooperatives are 180.393 and 800.000 homes are provided with electricity which corresponds to 15% of the total electric distribution market in Costa Rica and roughly 40% of the rural-area service. The energy mix of Costa Rica is comprised of 80% hydropower and 20% wind and geothermal sources.

Coopesantos – Cooperativa de Electrificación Rural de los Santos is one of the four electricity cooperatives in Costa Rica. It was founded in 1965 in San Critobal Sur and it began supplying electricity in 1969 and it successfully served 2,231 consumers, covering the 42% of the area it was representing. In the recent years, Coopesantos has 36.000 members and it covers the 99,7% of the energy services for 120 rural communities with a distribution grid of 1.200 km.

In 1966 there was a loan contract signed with USAID for 40 years, with a 10-year grace period at an annual interest rate of 1% and a 2,5 rate during the amortization period. The contributors - investors in the initial budget of the cooperative are presented in the Table 3 as follows. (Barnes, 2005)

Table 3 - Initial Investment in COOPESANTOS, by Contributor

Contributor	Amount (US$)
USAID (loan)	1.200.000

National Bank	75.757
ICE (construction)	114.788
Cooperative Members	169.464
Total Initial Investment	1.569.009

Picture 3 - Los Santos wind farm

Coopesantos, in 2011, originated one of the first initiatives in wind energy in Costa Rica and it contributed in a way that Costa Rica in the first 75 days of 2015, all of its energy came entirely from renewable sources, as a result it was named the greenest country in Latin America, as well as a model for large industrialized nations. The 15 wind turbines that the cooperative owns produce 42.000 megawatt hours (MWh) per year, so 11.000 households are provided with clean, renewable energy while 11.000 tons of carbon dioxide (CO2) are saved from being released into the atmosphere by non-renewable produced energy. At the end of 2014 the production of the Los Santos wind farm exceeded the estimated energy production, so a surplus of almost $ 1 million USD was created.

Concluding the most important contribution by energy cooperatives like Coopesantos and initiatives like Los Santos wind farm is their crucial role in alleviating poverty, improving human welfare and raising living standards. “This is achieved through demanding more intelligent, transparent and responsible forms of business, thereby improving peoples’ living and working conditions and reducing social inequality. Democratically governed energy cooperatives provide services at affordable costs, create economic opportunities for local communities and improve people’s health and education in a more fair and sustainable environment”. (Cooperatives Europe, 2015)

4. Energy Communities in Greece

4-A. Legal Framework in Greece

The European Commission's proposals for the participation of citizens in the energy transition

With a view to implementing the commitments stemming from the Paris Agreement of 12 December 2015 on Climate Change, the achievement of a Safe and Sustainable Energy Association and the move towards a clean energy system; The European Commission presented in November 2016 its proposals for reform of the energy sector. The so-called "winter package" promises clean energy for all Europeans and sets the foundations for strengthening individual and collective action in the energy markets of the future. Through self-production, demand management, access to more competitive energy and the ability to produce, consume, store or sell the redundant electricity again on the market, citizens have a dual role as producers - consumers ("prosumers") taking action to switch from one centrally controlled conventional power generation to decentralized, intelligent and interconnected markets.

Member States are invited to set up the appropriate institutional frameworks for local energy communities to "have the right to own, set up or lease Community networks and manage them autonomously"; access to all regulated markets either directly or through mergers or suppliers in a non-discriminatory manner to be treated in a non-discriminatory manner in respect of their activities, rights and obligations as final customers, producers, distribution system operators or mergers, fair and transparent procedures and charges reflecting costs. Particularly in the context of the promotion of RES, renewable energy communities are "entitled to produce, consume, store and sell energy from renewable sources, inter alia through electricity purchase contracts without being subject to disproportionate procedures and charges that do not reflect costs. In view of the above, Member States must take account of the specificities of energy communities when designing support schemes.

Abridged description of examples of energy partnerships in Europe

Europe has a long tradition of civilian and local energy partnerships as a result of the energy, political and economic crises it faced in the 20th century. Over the last decades, some 2,400 local cooperative societies have been developed, mainly in Germany, the

Netherlands, Denmark, Belgium, Italy, France and the United Kingdom, as well as federations and associations to promote their activities. Particularly:

In Germany, around 850 energy communities with 150,000 members are active. Their action is not limited to the production and supply of energy but extends to the possession and operation of electricity networks. A typical example of Elektrizitätswerke Schönau, a partnership initiated by the parents' initiative of the provincial city Schönau after the nuclear accident at Chernobyl in order to produce energy from environmentally friendly technologies, acquiring in 1994, following a referendum, management distribution networks and then ownership of them through court proceedings. At the same time, it supplies electricity to the local community exclusively from RES.

In Greece, local communities are already active in the field of electricity generation from RES, while cooperative schemes are further developed with the aim of decentralized electricity generation and energy autonomy of non-interconnected areas. Such an example is the "Sifnos Cooperative Company", which plans to implement a hybrid power station consisting of a wind park and a reversible hydroelectric plant using sea water, aiming to ensure the energy autonomy of the island exclusively using RES, the "Energy Cooperative Society of Karditsa", founded in 2010, aiming at the production and utilization of forest and rural local biomass and biofuels and the production and distribution of energy as well as the Urban Social Cooperative under the name "Energy Social Cooperative", which was founded in 2017 in Thessaloniki for the purpose of carrying out activities of production, cogeneration, saving, transport and energy services , based on the principles of the social and solidarity economy and direct democracy (Koutsopoulou, 2017). Many municipalities of Athens, Thessaloniki and Larissa, have already taken the first steps to use the virtual net-metering with the main purpose of addressing the local energy poverty by offering free electricity to affected households. The virtual net-metering will especially help the municipalities in which the residents live mainly in apartment buildings in areas that are where the space for energy projects is limited. (Mariya Gancheva S. O., 2018).

Law 4513/201800

In January 2018, the Greek European Parliament passed a law that substantially changes the structure of the framework for supporting renewable electricity, as it is created the definition of the role that citizens can play in the energy sector through the action of energy communities. Citizens, local authorities and private and public organizations are encouraged by the institutional framework to participate in the generation, distribution and supply of electricity. As far as the citizens - consumers of electricity are concerned, the law enables them to become "prosumers", that is, to be consumers and producers of electricity at the same time. (Mariya Gancheva S. O., 2018)

The establishment and operation of the Energy Communities as introduced and established by Law 4513/2018 constitutes a new and integrated institutional intervention supporting social economy in the energy sector.

- *Purpose*

Energy Community's purpose is to promote social and solidarity economy as defined in paragraph 1 of Article 2 of Law 4430/2016 (A 205) and innovation in the field of energy, to tackle energy degradation and promoting energy-saving, production, storage, self-consumption, energy distribution and supply, to strengthen autonomy and security in island communities and to improve energy end-use efficiency at local and regional level, through its activities in the fields of Renewable Energy Sources (RES), High Efficiency Cogeneration and Heat (CHP), rational use of energy, energy efficiency, sustainable transport, demand management and the production, distribution and supply of energy.

- *Basic activities*

In particular, they are entitled to carry out the following activities:

-Production, storage, own consumption or sale of electric or thermal or cooling energy from RES stations and CHP.

-Production, distribution and supply of thermal or cooling energy

-Supply of electricity or natural gas to Final Customers

-Managing raw material to produce energy from biomass or bioliquids or biogas

-Supply for members of energy products, electric vehicles and alternative fuel vehicles.

-Development, management and exploitation of alternative fuel and alternative fuel infrastructure

-Installation and operation of water desalination units using RES. within the region where E.C.

Still potentially they can exercise:

-Managing or participating in programs funded by national or European Union funds

-Provide advice on the management or participation of its members in funded projects

-Provision of energy services.

-Information, education and awareness at local and regional level on energy sustainability issues.

-Actions addressing energy poverty for vulnerable consumers or people below the poverty threshold, whether they are members of the energy community, such as indicatively providing or offsetting energy, energy upgrading housing or other measures that reduce energy consumption in citizens' homes of them.

- *Participants*

The right to participate in the Energy Communities has natural persons with full legal capacity, legal persons governed by public law or legal entities under private law, first degree local authorities of the same regional unit within which EC or businesses and second degree local authorities within the administrative boundaries of which EC is headquartered.

- *Revenues*

As far as the distribution of profits is concerned, they are not distributed to the members, but they remain in EC in the form of reserves and are available for its purposes by decision of the general meeting.

EC may be speculative by way of exception and only if the following conditions are met:

-the members of E.C. are at least fifteen (15)

-or the members of EC is at least ten (10) in the case of EC based in an island municipality

-and if 50% plus one of them are natural persons.

In this case the balance of net profits after the deduction of the reserves is distributed to the members.

- *Financial Incentives and Support Measures for EC*

-Ability to participate in programs of the Development Law.

-Incentives for RES and CHP stations.

-Specific conditions and terms of preferential participation or exemption from competitive bidding procedures Reduced Charges for RES stations participating in the electricity market.

-Exemption from the obligation to pay the annual fee for retaining the right to have a production license.

-Reduced amount of letters of guarantee required during the authorization.

-Priority in licensing.

-Exemption from the special fee of 1.7%, when local authorities participate in EC.

-Incentives for market participation - supply of electricity.

-Minimum capital for a supply license: € 60,000.

-Reduced amounts of letters of guarantee for registration in the Participants Register.

-The installation of photovoltaic stations and small wind turbine stations by EC is allowed to meet the energy needs of their members by implementation of Virtual Net Metering.

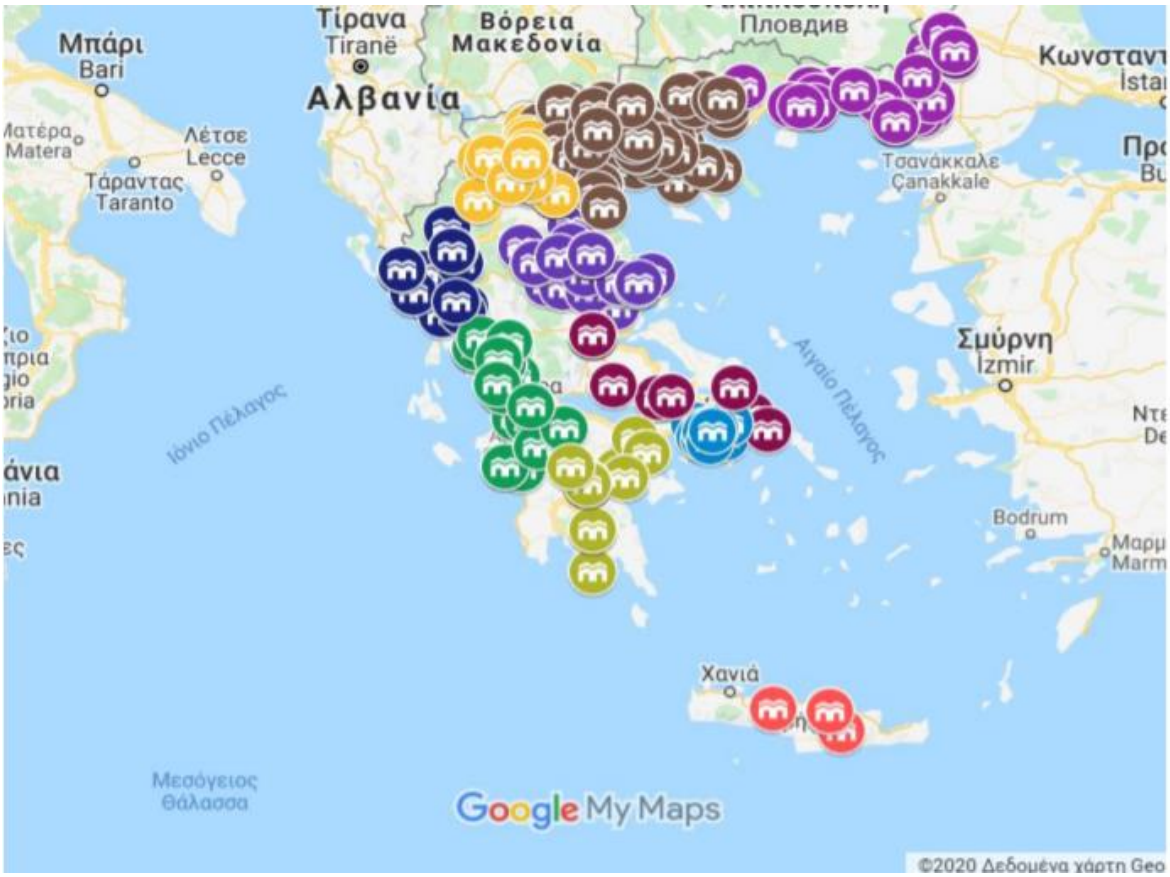
-Specific conditions for E.C. which operate as operators of charging infrastructure.

-Special Provisions for E.C. which will authorize thermal power stations for district heating. (Greek Ministry of Energy, 2018) (Koutsopoulou, 2017)

4-B. Examples of Energy Communities in Greece

In Greece today there are 409 total energy communities as shown in the map below. Most energy communities are located in Northern Greece where there is a greater need for energy consumption due to climate and weather conditions (239 are located in Macedonia), while most energy communities were registered in 2019 (267 energy communities) (ELECTRA ENERGY, 2020).

Picture 4 - Mapping of Energy Communities in Greece 2020 (ELECTRA ENERGY, 2020)



Indicative Energy Community examples

In the tables below there will be presented some indicative examples of Energy communities presented and detailed in order to demonstrate the structure of the various forms of energy communities (members, activities and character) that can be established and to highlight the incentives allowed by the new legislative framework.

S/N	Members of Energy Community	application / activity	AREA

Description **Incentives**: incentives provided for in the draft law **EC nature**: for-profit / non-profit			
1.	**Apartment Building**	**PV Net Metering**	**Residential zone**
The owners or users of the apartments of a building create an Energy Community in order to install a PV system or a wind turbine in a property that may even be located in another area and apply **virtual energy net metering** of the electricity produced by the PV system or the wind turbine with the consumptions of the apartments of the building. Using the virtual energy net metering the owners or users of the apartments / members of the EC will receive a reduced electricity bill. Indicative Power: 50kW Indicative Budget: € 60,000 **Incentives**: virtual energy net metering with consumption of EC members. **EC nature**: non-profit			
2.	**Energy Community - Businesses**	**PV system – Virtual Net Metering**	**Tourist Area - Island**
Five businesses (hotels, etc.) create an Energy community in order to install a PV system or a wind turbine on a property that may even be located in another area and apply virtual energy net metering of electricity produced by the PV system or wind turbine with the business consumptions, to reduce their energy costs. Indicative Power: 500kW Indicative Budget: € 500,000 **Incentives**: Virtual energy net metering with consumption of EC members. **EC nature**: non-profit			
3.	**Energy Community – Local Authorities**	**Actions for vulnerable consumers**	**Urban / Provincial municipality**
Three local authorities create an EC, in order to install a PV system or a wind turbine and to apply virtual energy net metering of electricity produced by the PV system or the wind turbine with their consumption and consumption of vulnerable consumers or citizens living below the poverty borderline. **Incentives**: Favorable provisions of the law for participation of local authorities, for actions on vulnerable consumers and virtual energy net metering. **EC nature**: non-profit			
4.	**Energy Community – Farmers, Foresters, Businesses**	**Supply Chain of Biomass - RES Unit**	**Province (mountain settlement, rural area)**

Farmers, foresters and / or companies active in the agricultural and forestry sector, create an Energy Community in order to create and manage a biomass supply chain and / or the installation and operation of a biomass unit for electricity and heat production. The supply chain can stoke the biomass unit and supply the residents with its products such as wood, pellets, etc.
Incentives: General EC incentives (egal form, participation in funding programs). Special incentives for RES stations (priority, reduced guarantees, exemption from license maintenance fees, etc.).
EC nature: for-profit

5.	**Energy Community – Residents – Businesses**	**Promotion of electromobility**	**Island**

Residents and businesses (gas stations, tourism companies, car rental companies, etc.) of a city or an island, create an Energy Community, for the installation of infrastructure for charging stations of electric vehicles (electric bicycles, electric small electric vehicles, etc.) and the rental of vehicles to visitors / tourists of the city or island.
Indicative project: 2 charging stations, 20 electric bicycles, 10 electric mopeds, 5 small electric vehicles.
Indicative Budget: € 150,000
Incentives: General EC incentives (legal form, taxation, participation in financing programs). Special framework for charging station operators.
EC nature: for-profit

6.	**Energy Community – Residents – Businesses - Municipality**	**Desalinization unit with RES**	**Island**

Residents and businesses of an island can create an Energy Community with the participation of the Municipality, in order to implement a desalination unit with RES (eg with a wind turbine), to address the problem of water shortage.
Indicative Budget: 2m €.
Incentives: General incentives EC (legal form, participation in funding programs). Special incentives for RES stations (priority, reduced guarantees, exemption from license maintenance fees, etc.).
EC nature: for-profit / non-profit, depending on the participation of local authorities / Individuals.

7.	**Energy Community – Residents – Businesses – Local Authorities**	**Small scale hydropower project**	**mountain / semi-mountain settlement**

The residents or businesses of an area together with the Municipality, create an Energy Community, in order to install a Small scale Hydropower Project with an indicative power of 1MW in the area.
Indicative Budget: 2m €
Annual Revenue: € 0.4m
Incentives: General incentives EC (legal form, taxation, participation in financing programs).

Special incentives for RES stations (priority, reduced guarantees, exemption from license maintenance fees, etc)
EC nature: for-profit

(Greek Ministry of the Environment and Energy, 2017) , (Kilias, 2019)

Energy Cooperative Company of Karditsa (ESEK LLC)

Integrated Energy Planning (IEP)

There have been various new ways and concepts which indicate the need for changing the way societies are being governed. It is world widely accepted that climate change has to be confronted in national level. Energy policies should support the pursuit of low emission limit targets and the invasion of RES in the energy mix of each country. These cannot be integrated overnight.

These new concepts of Integrated Energy Planning (IEP) develop new alternative ways of the organization of the society. They facilitate the more active and systematic participation of stakeholders in IEP. IEP connects the area-based conditions (spatial planning), areas that can accommodate energy initiatives in local or regional level, with the local society and economy. In the name of IEP multiple stakeholders – residents, local, regional and national authorities, institutions, universities, private sector etc. - with diverse and sometime conflicting objectives have to come to a general consensus for the sustainable energy planning and eventually for the general societal good.

One of these projects that promote IEP is the INTENSSS-PA. “INTENSSS-PA aims to develop and implement a human and institutional capacity building approach related to integrated sustainable energy planning, addressed to public authorities and societal stakeholders in order to support them to enter in a new era of energy planning through a participatory, multi-level, interdisciplinary decision making process” (INTENSSS-PA, χ.χ.).

This project adopted the Living Lab (LL) concept in order to implement this approach. “LL is an instrument (open lab & tool & methodology) analyzing existing product-service-systems as well as technical and socioeconomic influences focused on the economic & social needs of people at rural environments. Rural Living Labs aiming at the development of integrated technical and social open innovations and simultaneously promoting the conditions of sustainable development (highest resource efficiency, highest user orientation, attractive and adaptable business models” (Kallai, 2018).

RLL in Karditsa

In Karditsa the RLL is accommodated and coordinated by the Development Agency of Karditsa (AN.KA SA) (Ioanna Giannouli et al., 2018). The Energy Cooperative Company of Karditsa (ESEK LLC) is one of the first organized initiatives in Greece to exploit the renewable energy of biomass and more specifically of agro-biomass. ESEK has the legal form of civic cooperative (Law 1667/1986), thus it permits all interested residents of the Karditsa's prefecture or originating from it to participate in this cooperative and generate an energy independent prefecture.

It was founded in 15 July of 2010 by 476 charter members but there is a flow of new registrations until today. To become someone a member had to buy at least one mandatory share whose cost was 1.000€ and pay the registration fee (60€). Each member that would like to buy more shares can buy until five more optional ones. So the highest amount that someone could pay was 6.060€. There are a lot of incentives for the members but the main incentive is that the ESEK's members are entitled to receive their dividends that come from the sale of energy and products that ESEK produces.

Originally the cooperative had planned to build a small plant producing electricity from biomass having a capacity of 500 kW and afterwards the investment activities would be many more as the capital would be increased with the participation of new associates, aiming at more RES projects. The project had been divided into two phases. The first was the construction of the biomass processing unit that its production would aim at standardized products derived from biomass such as briquettes and pellet and the second phase was the construction of the power plant. The estimated budget for the second phase of the project was 1.000.000€ and it is going to be fully covered by the ESEK, while the first phase's budget had been estimated up to 500.000€ with the 50% support of the LEADER Program as an "exploitation plan of the forest biomass". (AN. KA SA)

The first phase of the project, i.e. the solid fuel factory (pellet), has been in full production since October of 2017 with a production of 500 tons/hour and with plans to reach 2.000 tons/hour. The members of the cooperative don't gain any profit by selling energy yet, but they are supplied pellet at 30 €/ton and the cooperative's meeting will decide whether the profits from the sales of the pellet will be distributed or will proceed to a new investment. (Mpellis, 2018)

Picture 5 - Biomass pelletizing line

In Picture 5, they are shown the Hammer grinder for pulverized raw material grinding, pneumatic transport line, CLM 304 Pellet press, presser conveyor, conveyor belt, vertical cooler, complete suction line with static filter and cyclones and weighing - sacking - heat sealing machine and they constitute the inside part of the pellet factory and more specifically the Biomass pelletizing line. (Delta Pi)

Picture 6 - Biomass Drying Line

In Picture 6 the Biomass Dying Line is presented with its apparatus. The equipment that is presented is consisted of a Continuous Dry Film Dryer which is designed to dry non-free flow products such as sawdust, wood chips, cotton seed, grass seeds, etc. The dryer is equipped with a closed industrial conveyor for loading the product, 4 double heat exchangers in the hot air channel and suction fans and cyclones. A biomass burner / boiler provides the hot water needed for the dryer's heat exchanger. (Delta Pi)

The purpose of the Energy Cooperative Company of Karditsa (ESEK LLC) is to contribute to the utilization, development, management, maintenance and protection of natural resources in the introduction of innovation and entrepreneurship in the production system, in the introduction and expansion of the use of renewable energy sources, in the support and development of new collective structures, in social development and more generally in the development of the Prefecture of Karditsa and if requested in other areas of Greece. The company has more than one sub-objectives that intertwine with the local community (AN. KA SA):

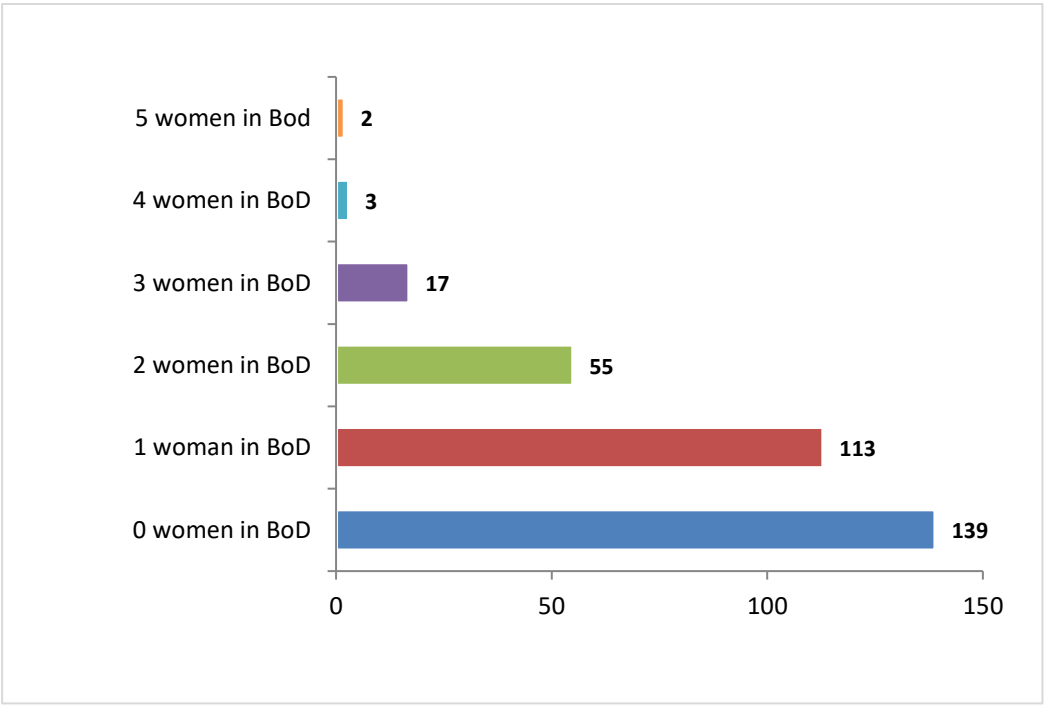
- The technical support of the Local Government Organizations (Local Authorities), and the Decentralized State Administration, the associations of Municipalities and Communities, the development associations, the companies of the Local Authorities. and other legal entities constituted or participating by the above bodies.
- The technical support of Local Development Programs that interest the Local Government, the encouragement of local productive initiatives and in general the support with any appropriate means of local development.
- Undertaking from sectors of the Municipal sector research, studies, training and other programs, related to Local Government, cooperative organization of producers and local development.
- The design and implementation of programs to prevent and combat the social exclusion of racism, xenophobia and all forms of discrimination.
- The design and implementation of rural development programs of the mountainous or lowland area, programs of protection and promotion of man-made and natural environment, as well as all kinds of programs that highlight the comparative advantages of the intervention area of the company's shareholders.
- The development of environmental protection activities.
- The implementation of relevant policies in inter-municipal or in a wider geographical area.
- The implementation of co-financed technical projects, social actions, services and supplies.

4-C. Gender Equality in Greek Energy Communities

Energy communities are a relatively new institution in Greece that promotes energy democracy as it enables citizens to produce the energy they use themselves or to enter the energy market as producers. It enables citizens to create communities in which everyone is equal and their vote on the boards counts the same. Many energy communities are moving away from the goal of producing and managing energy and setting some new goals for the development of the local community, ie for example, to address energy poverty in the local community, to create projects that will improve the lives of local community members, combating discrimination and promoting the rights of people with disabilities and gender equality.

At present, as we will see below, in terms of gender representation on the boards of energy communities is not equal. 93% of energy communities have less than 2 women on their board. Only 34% have a female member on the Board, while only 17% have 2. Only 1% have 4 or 5 women on the Board, while 42% of the Energy Communities have no female member. These data concern the 329 out of the total of 409 energy communities as mentioned in the research but failed to collect data from the other energy communities. Below is a table illustrating the participation of women in the Boards of Directors of Energy Communities (Greenpeace, 2020).

Figure vii – Participation of Women in BoD



Despite the reduced participation of women in the boards of the energy communities, there are some very promising projects such as the initiative of the Association of Women Entrepreneurs of Greece (AWEG) in collaboration with the Social Cooperative Enterprise ELECTRA ENERGY for the first women energy community in Greece with the aim of involving at least 200 women and a 1 MW project. Participating women will benefit from net metering or the share of profits to equalize the cost of electricity.

5. Conclusion: Suggestions and solutions

Now that the end of lignite has come and the use of oil has begun to decline, it seems that renewable energy sources are the only viable solution to implement the 17 Sustainable Development Goals (SDGs), zero emissions in the future and definitive tackling climate change. Greece has a great opportunity to utilize the abundance of natural resources it has in large reserves such as sun, air and water to achieve the energy transition to renewable and clean energy sources and the independence from expensive and polluting fossil fuels.

The energy transition paves the way for alleviating the phenomenon of energy poverty, unemployment, climate change and unequal access of entire regions or countries to modern energy services. The institutionalization (law 4513/2018) and the creation of energy communities with the simultaneous promotion of energy democracy enable the citizens to participate more in the production and use of sustainable energy, to contribute more to the energy transition, to cooperate with the local government in order to upgrade the local community either through projects or through campaigns to inform and educate all citizens on community issues.

Energy Communities offer multiple benefits to the local community. The private funds invested are diffused into the local economy, promoting local development and job creation. Especially the Non-Profit Energy Communities reinvest their financial surpluses in new RES and energy saving projects resulting in environmental, social and economic benefits to the local and not only society. Joint decision-making by all members, education and training of members and their participation in projects enable citizens to have more effective control, strengthen and realize energy democracy, while promoting awareness of energy savings. As ECs are not exclusively profit-oriented, their projects tend to be more respectful of the local environment as the impact of EC RES projects is assessed by the participating citizens and local authorities. Energy poverty can also be more easily tackled locally because energy communities can identify vulnerable households more accurately and take appropriate action such as providing free access to RES energy.

5-A. European legislative framework

With regard to the European Union, with the package of legislative measures for clean energy aimed at climate neutrality by 2050, there is an effort to strengthen the participation of citizens in the energy transition. It thus proposed a general legal framework to support citizens' participation in the energy market, and for the first time the role that energy communities and local social innovation will play in achieving the EU's climate and energy goals seems to be clearly recognized. EU Member States should transpose into their national legislation Directive 2018/2001 (European Parliament, 2018) on the promotion of the use of energy from renewable sources and Directive 2019/944 (European Parliament, 2019) on common rules for the internal electricity market, where states should safeguard the rights of energy communities and strengthen the new role of citizens in their energy legislation. In other words, they must provide a favorable framework for the promotion and development of EC.

5-B. Proposals for the legislative framework of Greece

Bureaucracy and simplified rules for smaller projects

Bureaucratic hurdles and strict procedures are usually very important factors in discouraging the creation of energy communities. In Greece, bureaucracy is one of the main reasons for investment failure. A typical example is the time period, which is usually very long, from the moment the file is submitted to the competent department until the issuance of the legal permit for the respective project. In order to support the creation of energy communities and to create a favorable framework, the procedures and rules from the establishment of the energy community to the licensing and implementation of a RES project should be simplified, especially for smaller local projects.

Quantities produced by Energy Communities

In order to encourage citizen participation in the energy sector, a measure could be taken that would stipulate that some amount of energy be produced by energy communities. This would promote a fair competition environment for the creation of new projects exclusively by energy communities, where the latter will not be restricted by competition with giant companies.

Financial support tools

RES projects need a fairly large initial capital to be implemented and its recuperation usually takes about 10 years. Tempting financial incentives should be provided for the promotion of RES projects by energy communities. A step in this direction would be the creation of a development fund that could be dedicated to Community energy projects, possibly at municipal / regional level, to support new projects by energy communities through direct investment or investment risk minimization mechanisms. These support measures must be combined with the provision of technical and legal advice, which is vital for the implementation of Community projects, as citizens participating in energy communities often do not have the technical capacity to develop a renewable energy project. Support to energy communities could also be provided in the form of a payment bonus for community projects. Given that there would be a clear and rigorous definition of energy communities that would prevent the exploitation of favorable provisions by false energy communities and hidden interests, this would be an excellent way of integrating environmental and social criteria that go beyond public profitability and would give a clear economic advantage to energy communities. Finally, tax cuts for citizens investing in energy communities could also be added to financial support tools.

A serious problem that needs to be addressed is the phenomenon of exploiting the favorable provisions that have been adopted for certain categories of citizens or for certain forms of collective activity by dextrous speculators. That is, they create energy communities in order to be licensed more easily and then sell the licenses, likewise the communities themselves. As a measure to limit this phenomenon, it is proposed to introduce restrictions on the resale of licenses received by energy communities.

An issue that will concern us from January 1, 2022 is the mandatory participation of all energy communities without exception in tenders to ensure operational support for RES projects. This amendment came to address the above phenomenon of speculation, but in this way it will weaken the existing genuine ventures and new initiatives from local communities, while it is a provision that creates obstacles to supporting energy democracy. In order to avoid the weakening of the energy communities, article 7 of law 4414/2016 should be amended immediately so that the energy communities in which first and second degree local authorities participate and those with more than 60 members are excluded from the competitive procedures and the 2021 onwards.

Empowerment of women in Energy Communities

Finally, as mentioned above, almost half of the energy communities in Greece are not represented by women on the boards while the majority of energy communities have less than 2 women on the boards. Addressing gender inequality on energy community boards

is another step towards energy democracy and the achievement of SDG 5, the United Nations' goal of achieving gender equality and empowering women. For this reason, informing women in local communities about the collective and individual benefits of participating in energy communities, about enabling women to participate in the energy transition, strengthening SDG 5 and the strengthening of the role of women in social events and projects that will take place in the local community. In this direction, it is proposed the financial support of non-profit energy communities at least, in the boards of which more than five (5) women will participate, in the form of tax relief. The purpose of this measure is to give an additional incentive to the energy communities to reach out and inform as many women in the local community as possible in order to participate in the respective energy community and in fact to redistribute the benefits of this relief to the community itself for example in the form of projects or with the help of vulnerable households.

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