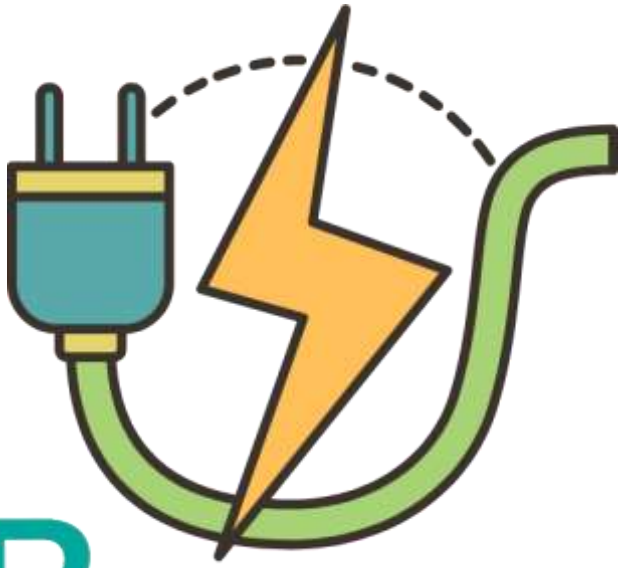

POWER youth

Empowering youth for energy community

Capacity building training follow up handbook

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List of abbreviations

EU	European Union
EC	Energy Community
REC	Renewable Energy Community
CEC	Citizen Energy Community
SMEs	Small and Medium size Enterprises
RES	Renewable Energy Sources
GHG	Greenhouse Gas
NZECs	Net Zero Energy Communities
EVs	Electric-powered Vehicles
M&E	Monitoring and Evaluation
KPIs	Key Performance Indicators

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Executive Summary

The POWERYOUTH project is dedicated to empowering young people to actively engage in the energy transition. Recognizing the crucial role of youth in this process, the project provides educational tools, methods, and capacity-building programs to introduce young people to energy communities.

A core element of POWERYOUTH is its participatory approach, which fosters the dialogue between youth and local stakeholders, within which POWERYOUTH has developed three innovative tools:

- PARTICIPATE tool – A platform for young people to voice their opinions.
- DECISION tool – A tool for collective decision-making within energy communities.
- FINANCE tool – A tool to explore new business models and financing schemes.

The project is being implemented in five EU countries—Austria, Greece, Latvia, Poland, and Portugal.

A central point of the whole initiative is the POWERYOUTH capacity-building program, designed to train and support young people who will drive the replication of the approach across the EU.

The training curriculum covers:

- The fundamentals of energy communities.
- The role of youth in shaping sustainable and community based energy solutions.
- The connection of energy communities with electricity generation & supply, energy efficiency, and electromobility.
- Strategies for monitoring and evaluation of energy communities.
- Guidance on how young leaders can become Energy Community Initiators or Youth Energy Ambassadors.

This document serves as a comprehensive resource, providing all materials covered in the training along with additional insights and references.

Ultimately, POWERYOUTH aims to equip young people with the knowledge, skills, and tools to take leadership roles in the energy transition, ensuring a more sustainable and participatory energy future based on community schemes.

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Introduction

A few words on the project

The POWERYOUTH project acknowledges the significance of youth involvement in the energy transition and aims at empowering young people to have an active role in this process, within their countries. To do so, the project has developed material, tools and methods to familiarize young people with a key concept of the energy transition; energy communities.

Through a thorough capacity building programme; with the involvement of experts in the field of energy communities and a concise and interactive training, POWERYOUTH aims at initiating the establishment of a dialogue between young people and local stakeholders. This way, it contributes to increasing the involvement and leadership of youth in energy communities, which is crucial.

The cornerstone of the POWERYOUTH concept is a participatory approach that facilitates this dialogue and empowers young people in actively participating in energy communities.

To this end, POWERYOUTH has developed the appropriate tools and methods to facilitate youth empowerment in energy communities in three stages. First, by delivering a participatory democracy platform to allow young people voicing their opinions ('PARTICIPATE' tool); then with a tool to support collective decision making ('DECISION' tool); and finally by providing a tool for promoting innovative business models and financing schemes ('FINANCE' tool).

The POWERYOUTH approach will be implemented in five EU pilot countries (Austria, Greece, Latvia, Poland, and Portugal) targeting the establishment of at least 10 youth energy communities empowered by its methodology, and the involvement of at least 1,000 young people and other stakeholders.

In the light of the above, with the support of EU-wide networks of local and youth communities, POWERYOUTH has created and delivered a capacity building programme to train young people on energy communities and to create a cohort of Youth Energy Community Leaders that will act as multipliers towards the replication of POWERYOUTH approach across EU.

As a follow-up of this training, the current document provides all the information presented during the capacity building training with additional content per section and the sources used for it, so that the attendees can conduct further research on their own and gain additional knowledge and expertise on the topics discussed during the training.

Training Curriculum

The curriculum of the POWERYOUTH capacity building training consists of five main parts. In Part I the concept of Energy Communities is being presented along with some necessary definitions, some key relevant factors, the main characteristics of energy communities, as well as some of the provisions included in the respective EU

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Directives. Also, in this first part of the training, the necessary stages for the development of an energy community are being analyzed.

In Part II, the training focuses more on the role of youth in energy communities. The role of youth in the energy transition is being explained through the lenses of their technology literacy; their role as energy intense consumers; their understanding of renewable energy sources; as well as their skills into raising awareness and climate advocacy.

Part III is divided in three sub-parts which constitute the main learning modules of the training.

Module 1 focuses on energy communities as a means of electricity generation and supply. The key elements of these energy communities and their most common activities are provided while some cases of energy communities related to these activities are given.

Module 2 focuses on energy communities and energy efficiency, so the key elements and activities of this type of communities are presented and similarly to Module 1, some cases are also provided as examples.

Module 3 focuses on energy communities and electromobility and explores how each of these concepts helps promote the other and why they are important in the discussion on energy transition. Similarly to Modules 1 and 2, there is also a reference on a case of an energy community that includes electromobility in its operations.

Part IV explains why a process of monitoring and evaluation is necessary for energy communities to optimize their operations and to increase their positive environmental and social impact. It also presents some of the ways to conduct monitoring and evaluation to that scope.

Lastly, part V unfolds the ways in which the young leaders trained within the POWERYOUTH capacity building programme, can become Energy Community Initiators or Youth Energy Ambassadors and multiply the effects of the approach.

Part I	What is an Energy Community?
Part II	The Youth Element in Energy Communities
Part III	Energy Community Modules
Module 1	Generation and Supply
Module 2	Energy Efficiency
Module 3	Electro-Mobility
Part IV	Energy Communities Monitoring and Evaluation Process
Part V	Becoming an Energy Community Initiator and/or Youth Energy Ambassador

Learning Objectives

Based on the description of the structure of this training the key learning objectives include:

Participants are expected to become familiar with the concept of energy communities; to understand the main characteristics of energy communities and how they facilitate

the energy transition; as well as to gain knowledge on the stages necessary for the development of an energy community.

Also, participants are going to realize how important the role of youth is in the energy transition and they be led to comprehend the necessity of increasing youth engagement in energy communities.

During the presentation on the three main learning modules, participants will see how energy communities can be connected with “Generation and Supply”; “Energy Efficiency”; and “Electro-mobility” and will learn more about it through example cases.

Then, participants are expected to learn why monitoring and evaluation are significant processes for the optimization of the benefits energy communities bring to their members and the overall society; as well as, how to make these processes more effective.

Last but not least, the participants are going to learn how to become initiators of an energy community or how to multiply the results of this training by becoming Youth Energy Ambassadors.

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Part I - The concept of Energy Communities

Key characteristics & Preparation stages

"Energy community" is a term many people are not familiar with, yet it constitutes one of the main ways to safeguard energy democracy and the transition towards new sustainable energy systems that are inclusive, just and they do not leave anyone behind. That said, in this chapter the concept of energy communities is explained and the key characteristics of it are presented.

Definitions; The concept of energy communities and the role of the citizens

A general definition, combining all the key elements of an energy community, could be formed as such:

An Energy Community is first of all a legal entity, which operates autonomously and based on open and voluntary participation of citizens, SMEs (small and medium size enterprises), and local authorities. The members of an energy community, who are the ones running its operations, must be based – in their majority – in the same region where the community is established (1).

The principal scope of an energy community is to provide environmental, economic or social benefits, while it may engage in activities like energy generation, distribution, supply, consumption, aggregation, storage, energy efficiency services or charging services for electric vehicles or providing other energy services to its members or shareholders.

To dive deeper into the definitions around energy communities it is important to see how they are being described by the European legislation and most specifically, by the DIRECTIVE (EU) 2018/2001 on the promotion of the use of energy from renewable sources and the DIRECTIVE (EU) 2019/944 on common rules for the internal market for electricity, where two different terms are being used – "renewable energy community (REC)" and "citizen energy community (CEC)" – accordingly.

A) Based on the first, DIRECTIVE (EU) 2018/2001 on the promotion of the use of energy from renewable sources (2):

"Renewable energy community" means a legal entity:

(a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;

(b) the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;

(c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.

B) Based on DIRECTIVE (EU) 2019/944 on common rules for the internal market for electricity (3):

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“Citizen energy community” means a legal entity that:

(a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises;

(b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and

(c) may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders.

In addition to the definition of energy communities per se, it is interesting to see how these two directives define the citizens engaged in energy communities, considering that their role is central to the development of the concept, using the terms “renewables self-consumer” and “active customer”, respectively.

A) Based on DIRECTIVE (EU) 2018/2001 on the promotion of the use of energy from renewable sources (2):

“Renewables self-consumer” means a final customer operating within its premises located within confined boundaries or, where permitted by a Member State, within other premises, who generates renewable electricity for its own consumption, and who may store or sell self-generated renewable electricity, provided that, for a non-household renewables self-consumer, those activities do not constitute its primary commercial or professional activity.

B) Based on DIRECTIVE (EU) 2019/944 on common rules for the internal market for electricity (3):

“Active customer” means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a Member State, within other premises, or who sells self-generated electricity or participates in flexibility or energy efficiency schemes, provided that those activities do not constitute its primary commercial or professional activity.

Based on the above, it can be summarized that energy communities are a form of collective citizen initiatives in order to affect and eventually improve the energy system. In that sense, energy communities are entities that engage in energy-related activities such as generation, distribution, supply, aggregation, consumption, sharing, storage, and provision of energy services. At the same time though, these entities are – in their majority - non-commercial actors within the energy market. Indicatively, energy communities may appear as collective switching campaigns, joint investments in solar panels, owning energy supply companies, or managing distribution networks.

As a general rule, energy communities operate on the principles of open and voluntary participance and governance; are owned and controlled by citizens, local authorities, and SMEs; and they prioritize social, environmental, or local economic benefits over profit-making.

Key characteristics

The key characteristics of energy communities derive from the two EU Directives, mentioned in the previous section, and the ways it is provisioned in these that they operate.

More specifically, in accordance to article 22 of DIRECTIVE (EU) 2018/2001 on the promotion of the use of energy from renewable sources, it is foreseen that "final customers, in particular household customers, shall be entitled to participate in a renewable energy community while maintaining their rights or obligations as final customers, and without being subject to unjustified or discriminatory conditions or procedures that would prevent their participation in a renewable energy community, provided that for private undertakings, their participation does not constitute their primary commercial or professional activity" (2).

Furthermore, under the same article, "renewable energy communities shall be entitled to:

(a) produce, consume, store and sell renewable energy, including through renewables power purchase agreements;

(b) share, within the renewable energy community, renewable energy that is produced by the production units owned by that renewable energy community, subject to the other requirements laid down in this Article and to maintaining the rights and obligations of the renewable energy community members as customers;

(c) access all suitable energy markets both directly or through aggregation in a non-discriminatory manner".

While member states are required to carry out assessments of the existing barriers and potential of development of renewable energy communities in their territories and as an extend to that they are also expected to provide an enabling framework to promote and facilitate the development of renewable energy communities (2).

"That framework shall ensure, indicatively and not restrictively, that:

(a) unjustified regulatory and administrative barriers to renewable energy communities are removed;

(b) renewable energy communities that supply energy or provide aggregation or other commercial energy services are subject to the provisions relevant for such activities;

(c) the relevant distribution system operator cooperates with renewable energy communities to facilitate energy transfers within renewable energy communities;

(d) renewable energy communities are subject to fair, proportionate and transparent procedures, including registration and licensing procedures, and cost-reflective network charges, as well as relevant charges, levies and taxes, ensuring that they contribute, in an adequate, fair and balanced way, to the overall cost sharing of the system in line with a transparent cost-benefit analysis of distributed energy sources developed by the national competent authorities;

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(e) renewable energy communities are not subject to discriminatory treatment with regard to their activities, rights and obligations as final customers, producers, suppliers, distribution system operators, or as other market participants;

(f) the participation in the renewable energy communities is accessible to all consumers, including those in low-income or vulnerable households;

(g) tools to facilitate access to finance and information are available;

(h) regulatory and capacity-building support is provided to public authorities in enabling and setting up renewable energy communities, and in helping authorities to participate directly;

(i) rules to secure the equal and non-discriminatory treatment of consumers that participate in the renewable energy community are in place" (2).

Moving on, and developed in the same spirit, article 16 of DIRECTIVE (EU) 2019/944 on common rules for the internal market for electricity provisions that "member states shall provide an enabling regulatory framework for citizen energy communities ensuring that (3):

(a) participation in a citizen energy community is open and voluntary;

(b) members or shareholders of a citizen energy community are entitled to leave the community;

(c) members or shareholders of a citizen energy community do not lose their rights and obligations as household customers or active customers;

(d) subject to fair compensation as assessed by the regulatory authority, relevant distribution system operators cooperate with citizen energy communities to facilitate electricity transfers within citizen energy communities;

(e) citizen energy communities are subject to non-discriminatory, fair, proportionate and transparent procedures and charges, including with respect to registration and licensing, and to transparent, non-discriminatory and cost-reflective network charges in accordance with Article 18 of Regulation (EU) 2019/943, ensuring that they contribute in an adequate and balanced way to the overall cost sharing of the system."

At the same time, in accordance with article 16, members states may also provide in the enabling regulatory framework that citizen energy communities are, indicatively:

(a) open to cross-border participation;

(b) entitled to own, establish, purchase or lease distribution networks and to autonomously manage them.

In addition, member states are expected to ensure that CEC:

(a) are able to access all electricity markets, either directly or through aggregation, in a non-discriminatory manner;

(b) are treated in a non-discriminatory and proportionate manner with regard to their activities, rights and obligations as final customers, producers, suppliers, distribution system operators or market participants engaged in aggregation;

(c) are financially responsible for the imbalances they cause in the electricity system; to that extent they shall be balance responsible parties or shall delegate their balancing responsibility in accordance with Article 5 of Regulation (EU) 2019/943;

(d) with regard to consumption of self-generated electricity, citizen energy communities are treated like active customers […];

(e) are entitled to arrange within the citizen energy community the sharing of electricity that is produced by the production units owned by the community, subject to other requirements laid down in this Article and subject to the community members retaining their rights and obligations as final customers. – For the purposes of this point, where electricity is shared, this shall be without prejudice to applicable network charges, tariffs and levies, in accordance with a transparent cost-benefit analysis of distributed energy resources developed by the competent national authority" (3).

Lastly, article 16 defines that member states may also decide to grant CEC the right to manage distribution networks in their area of operation and establish the relevant procedures […], in which case, "states shall ensure that CEC:

(a) are entitled to conclude an agreement on the operation of their network with the relevant distribution system operator or transmission system operator to which their network is connected;

(b) are subject to appropriate network charges at the connection points between their network and the distribution network outside the citizen energy community and that such network charges account separately for the electricity fed into the distribution network and the electricity consumed from the distribution network outside the citizen energy community […];

(c) do not discriminate or harm customers who remain connected to the distribution system" (3).

Differences in the definitions at the EU level (1):

Based on the European framework, which affects all of the EU Member States that will have to embody these directives in their national legislation – if they have not done so already – some key differences between Renewable Energy Communities and Citizen Energy Communities can be identified as follows.

Renewable Energy Communities (REC) involve projects related to all forms of renewable energy; are established in close proximity with these renewable energy projects and accept as their members individuals, local authorities and micro/small/medium enterprises. In addition they are autonomous from individual members and traditional market actors while they are effectively controlled by these very members.

Citizen Energy Communities (CEC) are technology-neutral (only electricity), with no geographic limitations and open to any participant.

Legal forms

Energy communities often appear in a variety of legal forms, the option of which is highly dependent on the national legislation of the country they are active in. These legal forms are explained in this section, as such (1):

Energy cooperatives

The most common and fast-growing form of energy communities. This type of ownership prioritizes the benefits of its members and is popular where renewables and community energy are advanced.

Limited partnerships

Allows individuals to share responsibilities and profits through community energy participation. Governance is often based on the value of each partner's share, which may not guarantee one member - one vote.

Community trusts and foundations

Focuses on generating social value and local development, using profits for the community as a whole, even when citizens cannot invest directly.

Housing associations

Non-profit organizations that can provide benefits to social housing tenants, although tenants may not have direct decision-making roles. Ideal for addressing energy poverty.

Non-profit customer-owned enterprises

Used by communities for managing independent grid networks, including community district heating networks, common in countries such as Denmark.

Public-private partnerships

Local authorities collaborate with citizen groups and businesses to ensure energy provision and other community benefits.

Public utility company

Run by municipalities to manage utilities on behalf of taxpayers and citizens, suitable for rural or isolated areas.

Energy cooperatives (4)[1]

Energy cooperatives are – in many cases – a more preferable legal form for the initiation of an energy community and it is interesting to explore some critical points of these. This type of ECs are types of social and economic enterprises, which allow citizens to collectively own and manage energy-related projects and services.

Their key elements include democratic governance – since every member is entitled to have one vote each for the decision-making processes within the cooperative. In addition, citizens are enabled to consume and share energy from RES, while they can also invest by buying shares or financing projects. Plus, surpluses are reinvested to support the members and/or the community.

Key principles of energy cooperatives are the open and voluntary membership; the democratic control by the members; the autonomy and independence; the promotion

[1] Reference No 4, chapter 5 on Energy Cooperatives.

of education, training and information; the promotion of cooperation among cooperatives; as well as the concern for the community.

Comfort and ease

Apart from the framework foreseeing the operation of energy communities and the principles and core values that relate to these, it is important to highlight a significant aspect of energy communities, which is their contribution in enhancing consumers' comfort and ease.

That said, energy communities increase their members' comfort and ease by providing personalized and community-based energy solutions that not only support the members financially by leading to cost savings but they also increase their energy security. The main benefits members can get out of their participation in energy communities include stable and reliable energy supply; community-based demand management; social and economic inclusion; as well as opportunities for education and raising awareness (5).

Challenges and opportunities

The development of an energy community often meets important barriers that might act as factors of discouragement for potential initiators, especially if they are young or not experienced enough. Such barriers include regulatory gaps and complex energy market rules that may make the process of development and operation difficult for energy communities – depending on the local context as well. In addition, in several cases, the initial investment and funding requirements might be very high. At the same time, participating in such an energy community sometimes require technical expertise and technology knowledge for community members, while these members may often find themselves trying to overcome issues of limitation in the grid's capacity (4)[2].

On the other hand, energy communities are often connected with significant opportunities. For instance, energy communities have received enhanced support from EU and national governments for community energy projects, while innovative financing solutions (e.g., crowdfunding, grants) are often available for them. In addition, a direct result from the development of such communities is the increased citizen awareness and public support for green initiatives.

Preparation stages

General timeline/steps to follow as a roadmap

To support the participants into taking up the initiative to start an energy community project, the POWERYOUTH capacity building training provides a roadmap – a set of steps – to follow, so that a new youth energy community can become reality. These steps, as presented in the following 10-points flow, are briefly analyzed here, as such (6):

[2] Reference No 4, chapter 23 on Barriers and Challenges

Step 1: Interconnect and build synergies with the local authorities

Local authorities are of utmost importance in both the energy transition in general and the development of community energy projects in particular. There are plenty of ways in which municipalities can promote such projects, while in reverse, energy communities can highly contribute to a municipality's objectives on green energy and climate action.

To achieve this step, it is necessary to identify the local stakeholders (local and regional administrations, competent authorities etc.). Then, prepare by compiling a list of potential common objectives shared by your youth energy community and your municipality; it might be helpful to check your municipality's action plan, if available, to do so.

In addition, make sure to connect with the local authorities by contacting the right people in the appropriate roles. This way, you can reach out for support and describe your intentions, your plans and why such a collaboration is necessary.

Step 2: Assemble the leadership team

The leadership team will be the main representative of the energy community. Thus, it should be approved by the entire team, and it must serve the interest of all the members of your community. Further, it needs to be aligned with criteria of inclusive representation.

To achieve this step, start by building a group of young people with whom you share the same visions and values for the development of the energy community, define the structure of your energy community together and then allocate roles and duties among the members of the team. Doing so, make sure to justify the reasons why each role fits each member and then plan a standard process of renewal or cease for these roles.

Step 3: Define the local context

Your youth energy community will be based on the local context within which it will grow. Thus, it is necessary to map the local landscape. You need to define the geography the energy community will be developed in, as well as the local population available and willing to participate in it.

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In addition, it is necessary to map the local economy. To do so, define the key economic activities taking place in your region; the level of energy poverty (if it exists); and the social and economic impact your energy community can have there.

Step 4: Identify the local potential

Along with the local context, you also need to identify the local conditions and the local potential which are crucial for the success of your project. In other words, map the local energy demand, consumption and supply.

Then, map the local potential on Renewable Energy, using feasibility studies or GIS tools for instance (e.g. some regions are more suitable for PVs than others or there are specific areas within these regions that a PV installation can be more efficient).

Finally, map the local needs and define if the focus of the energy community will be on generation & supply; energy efficiency or electromobility.

Step 5: Determine your shared vision

Before the development of your community starts, it is important to define the priorities and the key principles on which it will be built.

To do so, set up the guiding principles of your initiative (such as contributing to the just energy transition or to ensure equal and inclusive representation in it).

Als, define your priorities (for instance, minimizing environmental impact or tackling energy poverty) and make sure that these are part of a commonly shared vision within your team's members.

Step 6: Plan your goals, strategies and actions

In order to make the initiative both attractive and successful you need to have clear objectives and strategies.

To complete this step, define the goals of your energy community in a specific and measurable form.

Continue with planning a few alternative strategies to achieve these goals, taking into consideration the existing or potential challenges and barriers.

Move forward by defining the main actions and then the key activities that can help achieve these goals.

At this stage, make sure to also choose the legal form of the energy community you are creating.

Step 7: Develop stakeholder engagement

Hers, some key steps are necessary to follow in order to maximize your project's impact. In that sense, it is important to define the local stakeholders you need to reach out to, lay out a specific communication plan and share your narrative with more people to expand its positive effects.

This way, even more synergies with more stakeholders and local actors/entities will be shaped to support the development of your project.

Step 8: Define the financing concept

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To safeguard long term duration and viability of your project, you need to make it viable and based on some solid financial ground. This can be achieved by determining the financial model of your energy community (will it be for profit or non-profit etc.?).

Then, it is crucial to identify the local financial landscape (local actions in collaboration with local stakeholders that can bring income in the community).

And lastly, it is necessary to identify financial potential or/and funding opportunities. This way, you can make sure you will have some minimum funding sources for financial security in the long run.

Step 9: Prepare the implementation plan

At this stage, you need to put your plans and strategies in motion. To do so, some key steps to follow are to:

Define the structure of your energy community.

Set specific actions to be done towards achieving your objectives; within a specific timeline; linked to specific deliverables; and under the coordination of specific team members.

Get legal support and prepare the statute. Sign the necessary contracts. Prepare for and apply to get licensing from the competent permitting authority.

Finally, install the energy community's assets and initiate the energy community's activity.

Step 10: Set a monitoring and evaluation process

The success of your community is highly dependent on the constant potential for improvement. To safeguard this potential, it is critical to develop a monitoring and evaluation process to ensure that all stakeholders are informed and aligned with your activities and that any adjustments of strategies/actions improve the community; that the progress is recorded and thus, that your success is measurable.

In addition, to further optimize the use of energy in the community, it is useful to deploy energy management software to manage the energy community, as well as to monitor the ongoing maintenance of the installed assets.

Lastly, it is highly suggested to develop an internal process of progress review and updates that will be periodically updated.

Business plan

Apart from the 10 steps roadmap presented in the previous section, a business plan would be useful for someone who would be willing to initiate an energy community. Such a business plan should include (at least) the following steps (4):

1. Establishing the purpose of the energy community

Clarify whether the primary goal is to lower energy costs, generate income through energy production, or access clean renewable energy. Then decide if the community aims to be commercially viable or to operate as a not-for-profit. And collaborate with members to form a clear mission statement before moving on to operational steps.

2. Understanding permitted models in the region

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As already mentioned, not all forms of energy production are legally permitted, or easily applicable, everywhere. This is why it is important to gain a strong grasp of relevant regulations and to seek expert guidance or conduct an assessment to begin with an appropriate model.

3. Evaluating financial options for various models

Power Purchase Agreements (PPA), collective self-consumption, and island mode operations are among the options used for running an energy community. So, make sure to conduct detailed financial planning and analysis to select the structure most appealing to investors for your project.

4. Selecting Suitable Technology

Ensure that local energy production is tailored to the conditions of the area. Doing so, make sure that you carefully pick the right technologies and determine suitable sites for building the community power infrastructure.

5. Creating a network of stakeholders

Nothing can be done without a strong network of support. Thus, pay attention at connecting with the right stakeholders, such as those people or SMEs in the region interested to get involved; with local authorities that might either be benefited by your project or they may facilitate its progress; as well as with the competent DSO.

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Part II - The role of youth in the development of Energy Communities

Introduction

The representation of youth is highly significant for achieving a just and inclusive energy transition. Especially considering how youth can be seen as a critical driver for energy innovation, young people have the potential – if given the space and opportunities – to influence both energy and climate agendas. Besides, their power as mobilized citizens and their commitment to these causes are among the keys to a long-term success of any socio-technical transition (7).

In addition, research has shown that there is a strong correlation between youth energy literacy and energy security, since they can have a central role in transforming the energy reality for specific communities. It is argued that youth energy literacy is essential to energy security, while energy security can boost the capacity of youth to essentially engage in energy transitions as well.

For example, in rural communities it is renewable energy projects that can play a key role in democratizing energy. And there, the way young people are open and willing to understand and get involved with new technologies is a factor of added value for the local energy transition (7).

Thus, allowing young people leading the energy transition and participating in renewable energy projects can lead to improved socio-economic for the whole community and increased educational opportunities for all the young people of an area. At the same time it contributes in the mitigation of the disproportionate and intergenerational effects of climate change on youth (7).

In fact, scholars often highlight that just energy transitions are those that enable youth to discover their potential, build new skills, and become meaningful actors in energy transition.

Understanding renewable energy

As already mentioned, youth constitute the part of the population that are often found to be more willing than older populations to accept, use, and financially support RES technologies. Of course, this is not horizontally and universally the case as it often depends on the local context and the opportunities provided to young people to get better-informed on these issues.

Thus, youth acceptance of RES projects is often associated with a higher awareness of renewable energy benefits due to higher exposure to social media, energy education, and renewable energy campaigns.

Especially in rural regions or developing nations, youth comprise a large portion of the population and understanding perceptions and attitudes is essential to helping youth become sustainable energy consumers and adopters of renewable energy technologies.

This is of utmost importance, considering that young people are not only a big percentage of the current - and constitute the majority of the future – energy

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consumers, but they are also the group of people where future energy decision-makers will come from (8).

Energy consumption among youth

Apart from their ability to understand technology and hence, energy applications of it, youth is a group of energy intensive consumers. In parallel though, they are also a group being highly aware of climate change.

This combination is important because boosting their understanding on climate change leads to adding a sense of responsibility in their energy use. And to that cause, educational systems have a significant role to play in changing youth energy consumption behaviors.

The goal here would be to provide the necessary context and information to young energy consumers so that their consumption habits and lifestyles can be realigned to better match their environmental values, norms, and beliefs. Besides, youth can be agents of change by influencing even more people, older members, in their social networks with energy-saving behaviors (9).

Youth as drivers of change in Energy Communities

Youth have always been drivers of change throughout a variety of socio-economic situations. Now, once again they have the potential to play the same role in energy democratization, by actively engaging in energy communities. Some of the key elements that make youth act as drivers of change are the following (7):

- Fresh perspectives

Young people often approach problems and challenges with creativity and out-of-the-box thinking that lead to original and effective solutions. In the same spirit, their drive to adopt innovation and new technologies and processes can revolutionize how energy is managed and distributed.

- Sustainability mindset

Young generations are more conscious of climate change and environmental impacts. This is a necessary way of thinking for the transition on a sustainable future that aligns well with renewable energy goals.

- Innovation and experimentation

Youth-led startups and initiatives have shown remarkable potential in developing cutting-edge green technologies and business models. At the same time, they often use new tools and social media campaigns in order to expand advocacy for green policies and support start-ups and innovation focused on clean tech solutions.

Youth as long-term stakeholders and sustainability advocates

Young people – even if it sounds as a cliché – have their future lying ahead of them. If they remain committed to the goal of a green, just and inclusive energy transition, they will be long-term factors of shaping the energy field.

Thus, youth participation in energy communities ensures continuity in the energy community efforts, as they have a vested interest in creating a sustainable future. As

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a result, building strong foundations with youth today, leads to safeguarding that energy communities continue thriving into future generations.

Additionally, including young people in democratic schemes, such as energy communities, can also have important long-term value. Youth-led initiatives can focus on inclusive decision-making processes, while creating leadership roles within energy communities for youth ensures their proper representation and supports the development of a sense of accountability.

Lastly, young people are more willing to adopt and preserve sustainable living models, affecting eventually more people to do so as well. Youth can advocate for and become the model of an eco-friendly way of living, encouraging the adoption of sustainable practices on a wider scale (7).

Youth as technology & innovation leaders

Youth, as briefly mentioned above, are often at the forefront of digital transformation, considering their adaptability and ease with using software and applications for many fields of their daily lives. In that sense, they are often equipped with the knowledge and/or the understanding to do the same in order to improve energy efficiency, storage, and distribution within communities.

Their capacity to be involved in smart energy systems including solutions such as smart grids, decentralized energy management, and innovative data analytics tools can help optimize energy usage within the energy communities driven by youth.

Further, young people often choose to gain expertise on renewable energy projects, as well as to participate in communities, organizations and voluntary activities that allow them to have hands-on involvement in installing solar panels, wind turbines, or exploring new sustainable tech options (8).

Doing so, young people are also becoming part of collaborative schemes working on innovations, either involving universities, or start-ups, or even involving energy communities and initiative for technology transfer and R&D.

Youth as awareness and advocacy champions

The role of youth is critical also in designing and running raising awareness campaigns. They can play a central role in raising awareness within communities, schools, and even among policymakers about the importance of RES and the importance of social inclusion within the energy system.

In addition, they are often very active in community engagement activities, by organizing workshops, webinars, and community forums that can be used to educate on clean energy practices and community building.

Youth have shown that they can initiate campaigns that requires physical presence to raise awareness on climate change and sustainable energy, with consistency, while at the same time they can exploit technology and spread the word farther, by using social media platforms with competency.

One of the most well-known examples regarding the youth's persistence to show up when raising awareness is necessary is the recent case of Greta Thunberg's global youth-led climate strikes that illustrate the power of youth advocacy. Also, youth

energy forums or networks for sharing best practices and knowledge are also becoming more and more known and valued over the latest years (7).

Youth as community mobilizers

Key factors that make youth act as community mobilizers involve their ability to easily engage with peers. Youth mobilize their peers and other community members to adopt sustainable practices, and it can be expected that they can do so also to increase participation in energy communities.

In that sense, they have the potential to encourage participation on community projects, such as community energy initiatives that may appear in a variety of forms (e.g. to set up a solar energy cooperative).

As mentioned above, their willingness to act in the spirit of volunteerism can lead to initiatives that have important social and environmental impacts. This may include participating in tree-planting, recycling, or clean-energy educational drives to create awareness and foster action.

As a result, youth contribute in creating shared vision. A future in which communities are developed around sustainable energy and inclusiveness, spearheaded by youth leaders. Some examples of these communities may be youth energy clubs, eco-friendly neighborhood groups, etc.

Youth in the multi-lateral energy space

These are some of the reasons for the importance of increasing the role of youth in the multi-lateral energy space.

The multilateral energy space is where actors (e.g., NGOs, communities, labor unions, academia, businesses, local governments, etc.) come together to discuss and work toward coordinated and collaborative actions of global importance.

Thus, from the Youth Strike for Climate (YSC), sparked by the Swedish teenager Greta Thunberg in 2018, which motivated youth worldwide to engage in climate action and to protest against “unjust climate policies” that threaten future generations – to empowered young communities becoming the administrators of their own energy production and consumption the role of youth is essential for the energy transition (7).

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Part III - Energy Community Modules

M1: Energy Communities focused on "Generation and Supply"

Main elements

Energy communities as groups of citizens, businesses, and public entities that collaborate to produce, manage, and consume energy have an active and crucial role to play in promoting energy decentralization, in increasing local energy autonomy, and fostering community engagement in the energy transition. Typically, energy communities engage in activities such as energy generation, distribution, supply, consumption, and energy storage.

In the first module of Part III of this training, the main elements of and the activities pursued by energy communities focused on generation and supply are developed.

The main elements of such energy communities include their ability to contribute in the following concepts, which also explains why they play such an important role in the energy transition (4)[3] & (10).

- Energy security and resilience

By local energy production, communities become more resilient and rely less on external energy sources contributing this way to the stability of the energy system. That said, this kind of resilience is important, and it protects the community against external disruptions, energy crises, and energy price volatility.

- Decarbonization efforts

Energy communities are the most effective 'tool' at the hands of citizens and communities to contribute in the decarbonization of the energy sector, to deploy RES and to help achieve the climate goals set, both nationally and internationally.

- Benefits in the local economy

Energy communities on generation and supply may often create jobs and economic growth within the community. For instance, through the installation of solar panels or wind farms, more job openings may arise in the local area. This situation opens the door to several re-skilling and up-skilling opportunities for people currently unemployed or under-employed in an area. Also, revenues generated from energy production can be reinvested in local projects or used to reduce energy costs for the members of the community.

- Democratic participation in the energy transition

Such types of energy communities provide citizens with more control over their energy supply, promoting democratic governance structures.

- Lower energy costs

Energy communities can reduce energy bills of their members through collective production, self-consumption, and reduced reliance on market rates for energy supply.

[3] Reference No 4, chapter 12-14

- Ownership and control

Typically, energy communities are citizen-owned, with local authorities and/or SMEs involved as stakeholders in some cases. Thus, they are based on democratic governance models where community members have decision-making power.

- Local production and distribution

The focus of these energy communities is on generating energy from renewable energy sources such as solar panels, wind farms, hydroelectric stations, or biomass plants. Energy is then supplied directly to the community members, promoting self-sufficiency.

- Energy sharing mechanisms

The energy surplus, in such communities, can be shared within the community or be sold back to the grid, creating financial and environmental benefits, allowing the community to grow further.

- Non-profit orientation

Many energy communities operate on a non-profit basis, prioritizing social and environmental benefits over profit-making.

- Collective investment and infrastructure sharing

Investments are often saved to build or maintain infrastructure, such as microgrids, district heating systems, and other, additional RES projects.

Activities of energy generation and supply in energy communities

Key activities involved in the energy communities that focus on generation and supply are explained below (4) & (10).

- Energy generation

The installation of renewable energy systems such as solar photovoltaic (PV) panels, wind turbines, geothermal systems, etc. are the most common activities related to energy generation and implemented by energy communities. The focus of these is to maximize the potential of the local energy system based on geography and the resources available, in a way that contributes in a decarbonized energy system.

- Energy supply and distribution

Energy communities can also act as energy suppliers, providing electricity or heating directly to their members or neighborhoods. Some examples include the creation of microgrids or supplying excess energy to regional or national grids under contractual agreements.

- Collective self-consumption models

The energy produced by the community is collectively consumed by community members to reduce costs and increase self-sufficiency. This usually happens based on virtual net metering or net billing processes – depending on the local framework of a region.

- Innovative energy management systems

In energy communities it is often to have utilization of smart grids, demand-response technologies, and digital platforms to optimize generation and supply activities.

M1: Energy Communities focused on “Generation and Supply” - Case Studies

OurPower Energy Cooperative (Austria)

OurPower (11) & (12) is an energy cooperative, founded in Vienna in 2018, aiming at engaging citizens in the electricity market. It has around 900 members and 1100 clients, and it operates a platform connecting more than 300 private electricity producers with consumers.

OurPower uniquely combines the functions of an energy community and a supplier, including households with solar PV systems, SMEs, and small-scale renewable energy producers like farmers with PV, wind, hydro, and bioenergy installations.

At the same time it promotes various RE technologies, including small wind farms, hydropower plants, and solar panels. In particular, solar panels of the cooperative are installed both on rooftops and ground mounted. Rooftop installations, ranging from small-scale (10 kW, 20 kW) to large-scale (up to 4 MW), are connected individually to the grid, while ground-mounted solar panels are also connected to the distribution system. This decentralized approach maximizes renewable energy usage and grid resilience.

OurPower Energy Cooperative highlights the necessity of inclusive representation in the energy transition and focuses also on engaging women and young people in its processes.

- Activities

OurPower’s business model is based on crowdfunding and community engagement. The main energy consumers in this cooperative include households and SMEs.

The cooperative also operates a peer-to-peer marketplace for RES electricity generated by its members and an empowerment platform for citizen energy. The market place software allows P2P matching on an energy basis, i.e. kWh/a, and provides detailed kWh-precise accounting and billing, while taking care of all energy business services such as balancing and clearing grid costs for customers. Agreements on cost and revenue sharing exist among cooperative members, ensuring fair distribution.

In addition, OurPower is active in pursuing further activities. Under that prism, the cooperative is developing and testing the serve-U app. An application that optimizes electricity consumption by providing real-time weather and generation data to its users. This app is expected to enable members to visualize their energy production and consumption, allowing them to adjust their energy consumption accordingly.

In addition, as the billing process involves data exchange through OurPower’s digital platform, improvements in it, as developed by the cooperative, are expected to allow the incorporation of additional smart devices to further enhance energy efficiency and data monitoring.

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Coopérnico (Portugal)

The Portuguese context for energy communities may be described as complex as they face liberalization and market dynamics while aiming to implement a cooperative logic.

Coopérnico (4)[4] & (13) is Portugal's first renewable energy cooperative, established to promote renewable energy production and cooperative energy supply. It started "with the aim of harnessing solar power for the benefit of local communities […] Coopernico rents roof-space for its PV panels from socially minded institutions, providing them with extra income".

Coopernico started with sixteen people from different areas of Portugal representing different sectors such as academia, NGOs and the private sector and an important step in the scaling journey of it was when the community became an electricity supplier in 2019.

Formalizing this responsibility signifies that the community took on responsibilities traditionally sitting with incumbents. The electricity produced by it is 100% renewable, produced through small plants, and is financed by the cooperative itself, which ensures a local guarantee of origin.

- Activities

Coopérnico develops solar projects, allowing citizens to invest in and benefit from renewable energy. Energy generated this way is sold to the grid, and revenues are then reinvested in social and environmental initiatives. Taking the production and supplying activities together, the energy community has 1,772 members, investments of €1.8 million, 2 MW production capacity and 1,179 contracts as of 2022.

In parallel, Coopernico remains a challenger of the status quo, although one that emerged operates and scaled in a self-sufficient manner. In its scaling journey, the energy community built local groups that serve as the "voice of the cooperative at the community level and transport Coopernico closer to people's concerns".

As the community operates nationally, the idea of these groups is to work with members of the community directly.

In addition to this, at the local level, members may organize activities, contact local institutions, etc. to discuss renewable energy production capacity and suggest ways to further assist of Coopernico. Also, the local groups are active in promoting several topics such as "electric vehicles or solar production" at the community level.

The organization of such events is described as "free from a strict structure", suggesting horizontality in the internal governance of Coopernico.

Lastly, as a national player Coopernico it has several advantages for its scaling, such as the opportunity to work directly with various legislators and to lobby for institutional changes to varying degrees of success; or the partnerships of the model that depend

[4] Reference No 4, chapter 12

on how they could best be built by having higher-scale legitimacy in the eyes of established institutions.

All in all, in Portugal, Coopernico has not relied on subsidies or support schemes and has managed to build a national-level community with multiple local initiatives operating relatively independently.

M2: Energy Communities focused on "Energy Efficiency"

Introduction

Energy communities focus on renewable energy generation, energy supply, and energy efficiency improvements, aiming at empowering communities to take control of their energy use and production, enhancing, this way, self-sufficiency and environmental sustainability. Thus, energy efficiency is a key focus area for energy communities.

Most commonly, energy communities focused on energy efficiency aim at cost savings; environmental benefits; energy security; and community benefits. Cost savings can be achieved by reducing energy waste and allowing energy communities to lower electricity bills for their members. Environmental benefits come from enhanced energy efficiency that contributes to lower greenhouse gas (GHG) emissions and supports climate goals. Energy security can be the result of reduced energy demand which enhances community resilience against energy price volatility and supply disruptions. And lastly, community benefits arise by engaging citizens in energy-saving initiatives, with which communities can foster stronger social ties and collective environmental responsibility (4)[5].

Main elements

In this section, the major elements of these energy communities are unfolded briefly (10).

- Participatory governance

Members actively engage in decision-making processes regarding energy-saving initiatives and projects.

- Energy audits and efficiency measures

Energy communities often conduct energy audits for residential, commercial, and public buildings and in order to achieve energy performance improvement, often proceed to implementing solutions such as insulation upgrades, smart metering for consumption monitoring, efficient lighting systems and energy storage.

- Demand response programs (14)

Members of this type of energy communities may participate in programs that reduce or shift electricity usage during peak demand periods, contributing to improved grid stability and lower costs.

- Education and awareness campaigns

[5] Reference No 4, chapter 15-17

Energy communities often initiate campaigns and programs for promoting energy literacy and awareness to encourage efficient energy use within households and businesses.

Activities and benefits

Energy communities that have energy efficiency at the heart of their scope and operation are often connected with specific strategies and activities that facilitate citizens' involvement to improved energy usage and buildings' energy performance. Such actions may include building improvements and renovations. By upgrading insulation, installing energy-efficient windows, and other retrofitting measures on the buildings that are involved in an energy community, their energy performance is improved, and energy efficiency is achieved as a goal of the community.

In addition, with the use of advanced energy management systems, energy efficiency can also be achieved. By using smart technologies to monitor and optimize energy consumption in real-time. At the same time, in this type of energy communities, collective energy purchasing is an important practice. Aggregated purchasing power to buy energy-efficient appliances and devices at reduced costs for the members of the community, is one of the ways to further foster energy efficiency in the community.

These activities lead to significant benefits that touch upon the economic, the environmental and the social domains. Firstly, such strategies lead to economic savings. Common results in that sense include collective savings on energy bills and access to subsidies, which are even more important for the vulnerable households benefited by the energy communities.

Furthermore, the practices mentioned above often result in reduced GHG emissions. Energy efficiency focused energy communities support national and international climate goals and improve the environmental impact of their members' energy consumption. In parallel, social cohesion is being enhanced, as the engagement of community members in shared goals, fosters a sense of ownership, responsibility and collaboration.

The concept of Net Zero Energy Communities (NZEC)

Net Zero Energy Communities (NZECs) are groups of buildings or regions that collectively produce as much renewable energy as they consume over the course of a year and their main goal is to achieve a net zero energy balance. To do so, NZECs aim at optimizing energy efficiency and generating renewable energy locally. These communities play a key role in minimizing GHG emissions and achieving climate targets on energy sustainability (15) & (16).

Some of the key benefits of NZECs include:

- Reducing the overall energy demand
- Contributing to energy independence
- Minimizing environmental impact
- Supporting local economies by creating green jobs
- Fostering community collaboration
- Decreasing energy costs for their members

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Energy efficiency as a principle is the cornerstone of the concept of NZECs as the primary purpose of these schemes is to minimize the overall energy demand, making it easier to achieve net zero energy balance through local RES generation.

Thus, lowering energy consumption through efficient lighting, appliances, building insulation, and thermal performance significantly reduces the amount of energy required from renewable sources.

Some of the key practices used in NZECs to ensure energy efficiency include (16):

- Building interventions such as insulation, efficient windows, and ventilation improvements that reduce energy losses as well as heating and cooling needs.
- Behavioral changes such as educating and encouraging residents to adopt energy-saving practices through awareness campaigns and real-time feedback mechanisms.
- Small scale interventions regarding the efficiency of appliances and lighting, such as the deployment of energy-efficient devices and LED lighting to reduce consumption without compromising comfort or functionality.
- Technological integrations like combining energy-efficient solutions with RES generation in order to maximize the benefits of both.

The types of technologies that are most met in NZECs, indicatively, involve (16):

RES technologies

- Solar Photovoltaics (PV): Solar panels on rooftops, community buildings, or shared spaces convert sunlight into electricity.
- Wind Turbines: Small and medium-sized wind turbines generate electricity where wind conditions are favorable to cover the community's energy needs.

Energy storage

- Battery Storage Systems: To store excess electricity produced during peak generation times, to balance supply and demand.
- Thermal Storage: Heat produced by RES can be stored and used later for heating purposes, reducing reliance on non-RES.

Efficient heating and cooling systems

- Heat Pumps: To provide efficient heating and cooling by transferring heat from one area to another.
- District Heating Networks: A centralized heating system that supplies heat to multiple buildings from a single, highly efficient energy source.

Smart technologies

- Smart Meters: To provide real-time data on energy consumption, facilitating the optimal usage of energy for the users.
- Energy Management Systems (EMS): Automated systems that optimize the balance between energy production, consumption, and storage.
- Demand Response Programs: To allow communities to adjust electricity usage during peak periods, increasing flexibility and reducing overall energy demand.

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M2: Energy Communities focused on “Energy Efficiency” - Case Studies

Spółdzielnia Energetyczna Eisall (Poland)

Spółdzielnia Energetyczna Eisall (17) & (18) is the first energy cooperative in Poland, registered in 2021, and operating in the Mazowieckie Province in the area of the neighboring municipalities of Raszyn-Nadarzyn-Michałowice, with production capacity of 2 PV micro-installations at 10 kW each.

The cooperative aims to offer comprehensive support in the creation and management of the Energy Cooperative; ensuring energy independence; increasing the use of energy from RES; reducing energy costs; as well as at ensuring stability of energy supply.

- Activities

The activities of the cooperative include electricity generation, electricity trading, electricity distribution, electricity transmission, business and management consultancy, engineering activities and related technical consultancy. While at the same time Eisall also conducts analysis and recommend the optimal combinations of energy sources, making it, thus, possible to increase energy self-sufficiency and optimize costs for its members; provides the participants of the cooperative with energy security and reduction of energy purchase costs while increasing the revenues of its producers; as well as provides innovative energy storage solutions for commercial and industrial applications (with Neo Energy Group).

Claremorris and Western District Energy Co-Op (Ireland)

Claremorris and Western District Energy Co-Operative (19) was founded in 2015 by a group of local people, at Claremorris of Ireland, and is located on the Ballyhaunis Road. The cooperative counts over 50 members, that are currently engaged on a voluntary basis to support communities in the transition to the low carbon economy.

- Activities

The co-op supports energy self-sufficiency by producing renewable energy that serves local buildings, including schools, public facilities, and local businesses, on which energy efficiency interventions are also taking place.

The cooperative owns tow 5MWe solar sites which are completely community owned, and has won RESS1 as the first of one 100% community owned sites in Ireland. Its partnership with Mayo county council for one of the solar sites which was previously a brown field landfill site is one of the milestones in its development. In parallel, it has developed some level of cooperation with 13 other counties in Ireland to promote renewable energy through solar, while it has supported another 9 energy co-ops through the connection to grid process.

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M3: Energy Communities focused on “Electro-mobility”

Introduction

Energy communities bring together citizens, businesses, and local authorities to collectively engage in various energy-related activities, among which electro-mobility is often included (4)[6].

Electro-mobility refers to the use of electric-powered vehicles (EVs) and the respective supporting infrastructure (e.g. charging stations) and energy communities can play a key role in developing, managing, and expanding EV infrastructure and promoting the adoption of EVs among members. At the same time, the use of EVs among the members of an energy community can support the overall energy efficiency of the community (20).

To begin with, the use of EVs in energy communities is connected with important environmental benefits, such as the reduction of GHG emissions. EVs are connected with fewer GHG emissions compared to conventional vehicles, enhancing the role of the community into achieving the relevant climate goals and improving the health and quality of life of its members too (20).

In addition, the use of EVs comes with long-term economic benefits too as they have important potential to generate revenue for the community by operating charging stations. In parallel to that, EVs can support energy security. By integrating electro-mobility with RES and local community production it is ensured that energy consumption remains sustainable and locally managed. EVs can often serve as distributed energy storage units, enhancing grid resilience (21).

Main elements and activities

Here, let’s briefly explore the key elements of energy communities with activities focused on EVs and how they are connected to particular activities that often take place within the energy communities.

- Collective planning and investment (22)

Energy communities need increased internal collaboration in order to install EV charging stations and expand the relevant infrastructure. The investments are shared among members, reducing both individual costs and risks.

- Integration with RES (22)

EVs, in such energy communities are planned to be charged by using locally generated renewable energy to maximize environmental benefits. This model also encourages decentralized energy production and consumption.

- Public awareness and trainings (23)

Education campaigns to raise awareness about the benefits of electro-mobility are often organized by such energy communities. At the same time, training programs for maintenance and technical support for EV infrastructure are also among the respective initiatives.

[6] Reference No 4, chapter 18

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- Shared use models (23)

Car-sharing schemes using electric vehicles for the benefit of community members encourages efficient vehicle utilization and reduces the overall number of vehicles needed.

- Demand management capabilities (24)

Smart charging technologies ensure that EVs charging is optimized to better respond to energy demand, grid stability, and renewable energy availability.

Importance of electro-mobility for energy communities and vice versa

EVs are important within the operation on an energy community because they can increasingly use RES if deployed within energy communities, leading to reduced carbon footprint from a life cycle assessment point of view (25).

Also, in order to reduce the emissions of the transport sector there will have to be a dramatical reduction on individual car use and switch to electricity. Community projects can help tackle both challenges, considering that an electric car sharing scheme in the community can act as a great activity for an existing community energy project to branch out into.

A cooperative can invest in a system of EVs where people can book and use. This way the cars are owned by the community instead of individuals and the idea creates higher community engagement in the sector of transport. Besides, the whole experience of car sharing is a more communal experience, allowing people to break with the individualist mentality of personal car ownership, in a spirit of sharing.

Additionally, this sharing mentality can further be boosted through using a European platform enabling energy communities across Europe to share e-cars within their communities. The platform allows projects to offer apps, web interfaces, online payments, and the software needed to set up a car sharing service in your own community, like tools to open cars without keys (26).

Every cooperative enterprise engaged in sharing electric cars can enhance community inclusion in the respective decision-making processes, often bringing different cooperatives together.

In addition, it is important to note that the efforts for decarbonization of the mobility sector is driving electro-mobility and has important potential to increase the flexibility of the power system substantially.

Moreover, such applications are of key importance and ensure that flexibility includes smart charging and vehicle-to-grid concepts that allow the feed-in of electricity from electric vehicles back to the grid. The main sources of flexibility in these cases are the car batteries themselves and the related charging infrastructure, which can delay and adjust in general, the charging process according to overall demand. Such flexibility is even more particularly important with PV generation potentially generating a large portion of the energy required to charge EV batteries (22).

In addition, the additional load of charging vehicles could increase peak loads on the grid infrastructure, which can only be avoided or reduced when charging processes are

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coordinated accordingly. Finally, EVs flexibility can also reduce the need for new power generation and lower the grid infrastructure costs eventually (22).

EVs integration and grid stability

As an extent to these, it is useful to highlight the connection between EVs integration and grid stability which is highly affected by the following factors (22).

A rising tendency in EV usage is being noted and as EVs grow in popularity new complexities to building energy systems that integrate RES arise. This leads to important energy demand considerations, since traditional energy demands in buildings (heating, lighting, etc.) are supplemented by the need to charge EVs, increasing overall energy demand. A situation that creates new restrictions on building energy infrastructure, making careful demand management necessary.

That said, these ne EV charging load related challenges make accurate EV charging load prediction and management critical. Without effective management, peak hour electricity demand surges could compromise the stability and safety of the grid. In addition, there is an extensive need for method of optimization. In that sense, efficient energy management systems and strategies, including rule-based strategies and optimization algorithms are key to managing energy systems in a holistic way.

In total, while rule-based strategies depend on expert knowledge, optimization algorithms seek optimal solutions using mathematical programming techniques. Thus, a combination of both methods can offer better overall optimization, addressing both energy scheduling needs and practical constraints.

M3: Energy Communities focused on “Electro-mobility” - Cases Studies

Tilos Island Energy Community (Greece)

Tilos (27), as part of the Dodecanese group of islands, lies in the mid sea between Kos and Rhodes. It belongs to the special group of remote and small-scale European islands, with total of ~830 registered inhabitants, and the winter period suggesting lower numbers, in the order of 500. On the other hand, the hosting capacity of the island during the summer months exceeds 30,000 visitors, with local tourism mainly oriented toward eco-touristic activities.

Over the recent years, Tilos island accelerated its clean energy transition in a remarkable pace, enabled by the strong commitment of the local Municipality, the pro-environmental culture and mindset of Tilos citizens and the implementation locally of innovative demonstration projects, such as the Horizon 2020 TILOS project.

The award-winning energy community on Tilos focuses on renewable energy generation and supply through a hybrid system of wind and solar power with battery storage. This community made Tilos a model for energy independence and has contributed to a more stable and clean local energy supply.

- Activities

The project supports community-scale wind and solar, battery energy storage, and advanced energy management and metering through Demand Side Management (DSM) strategies. At the same time, the local Hybrid Power Plant comprises an 800

kW wind turbine; 160 kW of photovoltaic power, and a Zebra (NaNiCl2) battery storage system of 800 kW/2.88 MWh.

The island has been interested in extending its efforts to the directions of e-mobility and renewable-driven EVs charging infrastructure. A municipal EV-fleet including different types of EVs and a 52-seat electric bus, solar-powered EV charging infrastructure, introduction of solar-powered street lighting systems and a smart metering platform engaging different types of distributed loads are some of the innovative elements advancing the existing infrastructure of the island.

This way, the integration of EVs in the energy system can foster local sustainable mobility, as EVs play a central role in promoting zero-emission transportation on the island. Moreover, it supports RES integration. Considering that Tilos relies on solar and wind power and EVs help mitigate the intermittency of renewable sources, a connection between these two factors is obvious for the success of the community.

It can also assist in grid balancing. As already explained, EVs act as flexible storage devices that can interact with the renewable energy system. By charging during periods of excess renewable generation and feeding back energy when demand spikes, EVs contribute to grid stability and ensure efficient RES deployment.

Finally, regarding the integration into the energy system, smart charging strategies are critical. EVs on Tilos operate within a smart energy management system that optimizes their charging and discharging schedules based on the island's energy production and demand patterns. Other than that, its Vehicle-to-Grid (V2G) capabilities are also important here. Especially in some cases that EVs act as dynamic energy storage units, contributing energy back to the grid during peak demand periods, further enhancing grid flexibility.

Monitoring and Evaluation of an Energy Community

The importance of monitoring and evaluation in energy communities

The key factors explaining why monitoring and evaluation are important for energy communities lie on the concepts of performance assessment; accountability; constant improvement; and regulatory compliance.

Starting with performance assessment, monitoring and evaluation processes help measure progress towards achieving the energy community's goals, such as emission reductions, cost savings, or energy efficiency improvements. Plus, on accountability, such processes provide the base for transparency and build trust among community members and stakeholders by demonstrating the community's achievements and areas for improvement.

Additionally, on the topic of continuous improvements, monitoring and evaluation processes are critical to help identify challenges, successes, and lessons learned, facilitating the improvement of energy initiatives and optimizing resource use. And lastly, on regulatory compliance, M&E helps ensure the community's compliance with national and EU regulations and supports reporting obligations to regulatory bodies.

That said, the key focus areas for monitoring and evaluation in the energy communities are the environmental impact; the economic outcomes; as well as the social benefits.

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Monitoring methods

In this section, some of the most common monitoring methods are being listed in ways that can be helpful to achieve proper monitoring for the energy communities.

- Data collection and analysis (28)

The use of smart meters in order to track energy consumption and production in real-time can provide critical data for performance analysis. In addition, the use of surveys and community feedback to monitor members' satisfaction, engagement levels, and perceived benefits can be useful for the community to monitor the level of satisfaction among its members.

- Environmental metrics (29)

To monitor the environmental impacts on an energy community carbon footprint measurement is a good solution that allow the calculation of the community's carbon emissions reduction compared to baseline data. In the same spirit, energy efficiency metrics can be used to assess the reduction in energy consumption due to implemented measures.

- Economic metrics (29)

To assess the economic aspect of the operation of an energy community, a cost-benefit analysis helps track the financial performance of energy projects and evaluate profitability. Also, monitoring the payback periods can contribute in measuring how long it takes for energy investments to become profitable.

- Social impact metrics (29)

Closing, in order to measure the social impact of an energy community, community participation rates are an important indicator. This way, the levels of engagement in meetings, initiatives, and programs can be monitored. Further, some periodical equity and inclusion assessments can evaluate whether all community segments benefit from energy projects.

Evaluation methods

In this section, some key evaluation methods are presented respectively.

- Baseline and benchmarking analysis

To conduct a proper evaluation, it is critical to start by setting a baseline, a point that establishes initial data for comparison over time. In the same way, benchmarking is crucial as a step in the process. This way, the performance of an energy community can be compared with similar communities or regulatory targets.

- Key Performance Indicators (KPIs) (29)

KPIs of various types are crucial to evaluating the progress of a project and can represent this progress in a variety of fields. Environmental KPIs are usually used to evaluate the reduction in carbon emissions, the increase on the RES shares, and the waste reduction. Economic KPIs can help evaluate the revenue generated, the operational savings, and the energy cost reductions for members. And social KPIs are

necessary to evaluate the membership growth, to collect satisfaction surveys, and to assess the benefits distribution across community members.

- Qualitative evaluation methods

Apart from the quantitative methods unfolded above, some qualitative methods are also very important for the evaluation process. An example of these is the development of focus groups and the use of interviews. These are used to collect insights into member experiences, challenges faced, and recommendations for improvement.

Recommendations on more effective M&E

Some general recommendations on how to make the processes of monitoring and evaluation more effective include the use of clear objectives and metrics. It is important to have specific, measurable, achievable, relevant, and time-bound (SMART) goals and it is necessary to develop customized KPIs aligned with these objectives, covering environmental, economic, and social outcomes.

In addition, to better conduct monitoring and evaluation, it is generally suggested to utilize technology and digital tools. Smart grids and IoT (Internet of Things) devices are necessary to use advanced digital tools for automated and real-time data collection. Also, data analytics platforms are significant to analyze collected data to generate insights, identify trends, and detect potential issues early.

Further, ensuring community participation is key to improved M&E, considering that it is significant to involve all community stakeholders in defining evaluation criteria and processes. It is also crucial to foster transparency by regularly sharing monitoring results with community members and exchanging insights and feedback.

Lastly, it is very important to keep experts and policymakers engaged in the process. It is useful to work with energy experts to design effective M&E frameworks for an energy community. In addition, it is critical to collaborate with policymakers to ensure that the community remains aligned with evolving regulations and goals.

Becoming an Energy Community Initiator / Ambassador

POWERYOUTH aims at providing the necessary tools to young people in order to help them take on the role of young energy leaders and foster energy transition in a way that empowers youth and places them at the center of the process. To do so, it equips young participants with the necessary tools and methods to become either Energy Community Initiators or Young Energy Ambassadors.

What is the Energy Community Initiator

Energy Community Initiators after being involved as young leaders in the co-creation process of the replication plan, they are expected to strengthen their post-project role and to be empowered to step in as initiators on new energy community endeavors that will lead to creating new business opportunities.

What is the Young Energy Ambassador

Young Energy Ambassadors, after being similarly involved in the process are expected to become key factors in expanding the impacts of the POWERYOUTH project and act as multipliers of the methodology across the EU, affecting and onboarding in the process other citizens, creating a multiplier effect towards energy sustainability in the society.

How to become Initiators and/or Ambassadors

The POWERYOUTH capacity building training provides all the necessary information for motivated young people to become well-equipped enough to take on either of the roles described above.

The training, apart from the learning material includes a thorough simulation activity where participants are asked to work on a real initiation case using the POWERYOUTH toolkit.

After the training is complete, young participants can move forward with sharing the knowledge and information gained in it with more young people and promote the replication of the process.

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Conclusion

As closing remarks, it is noted that the POWERYOUTH capacity-building training has worked on providing the necessary material and tools to successfully equip young people with the knowledge and skills they need to actively engage in the energy transition through youth energy communities. By empowering the young participants and showing them how to foster dialogue with local stakeholders, the training has emphasized the crucial role of young leaders in driving sustainable and community-led energy initiatives.

Some of the key takeaways from the training include that youth participation in energy communities is not only beneficial but essential for promoting innovation, inclusivity, and long-term sustainability. That said, young participants have now gained a strong foundation in energy communities' key characteristics and principles, the respective regulatory landscape, and the practical steps required to initiate and sustain an energy community project.

Additionally, they have been exposed to information on the intersections of energy communities with electricity generation and supply, energy efficiency, and electromobility, gaining insights into how these areas contribute to a greener energy system.

A significant outcome of this training is the emphasis given on youth empowerment and leadership. Participants can now become Energy Community Initiators or Youth Energy Ambassadors, ensuring that the POWERYOUTH approach has the potential to extend beyond the pilot countries and to influence a broader movement across the EU.

Moving on, active engagement, mentorship, and collaboration will be critical to maximizing the impacts of this training. The potential created by POWERYOUTH needs to be valued and utilized through continuous policy advocacy, financial support mechanisms, and community-driven projects that enable young people to lead the way in shaping a more inclusive, decentralized, and sustainable energy future.

Before closing, it is important – especially for young people – to always remember that, as Greta Thunberg has said, "you are never too small to make a difference".

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