Empowering youth for energy community

D4.1 POWERYOUTH learning modules

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List of abbreviations

Acronym	**Description**
WP	Work Package
D	Deliverable
T	Task
M	Month
EU	European Union
EC	Energy Community
REC	Renewable Energy Community
CEC	Citizen Energy Community
SMEs	Small and Medium size Enterprises
DSO	Distribution System Operator
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
YSC	Youth Strike for Climate
NGOs	Non-Governmental Organizations

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EMS	Energy Management Systems
PV	Photovoltaic
RESS	Renewable Electricity Support Scheme
ENVI	Environmental Impact
LPTV	Low carbon Public Transportation Vehicles deployment rate
ESP	Electrical Self-Production
TEU	Total Energy Used
SCR	Self-Consumption Rate
AEC	Annual Energy Cashflow
CAPEX	Capital Expenditure
EF	Economic Sustainability Factor
LR	Local Representation
SEE	Social Energy Empowerment
CS	Citizens' Satisfaction

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Executive Summary

The POWERYOUTH project aims at empowering young people to actively engage in the energy transition and to get involved in the development of energy communities. To achieve that, the POWERYOUTH approach includes a specifically designed capacity building programme to introduce young people to energy communities.

This document, D4.1, contains all the necessary information regarding the completion of Task 4.1, under WP4, which is about the POWERYOUTH learning modules. In the next sections of this document, detailed information about the process and methodology followed for the development of the learning material is provided, along with all the collected material to be included in the capacity building training.

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 and in this deliverable all of the material used to equip young leaders as such, is being overviewed and described.

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1. Introduction

POWERYOUTH aims at developing and providing a complete capacity building and replication mechanism that will facilitate and support the development of youth energy communities across Europe. As part of this mechanism, POWERYOUTH aims at developing learning modules for empowering such youth energy communities and encouraging young people to participate in the process of fostering energy democracy, as well as to expand their knowledge and support them in becoming experts themselves, creating a community of young leaders that will contribute to building a sustainable and democratized energy future.

Within this context, the WP4 of the POWERYOUTH project, dedicated on the Capacity building and replication across Europe and in particular Task 4.1: Development of learning modules for empowering youth energy communities has been developed through the readily available literature, as well as through research and information sources that have been extensively reviewed. The material reviewed and collected during this process has been used to develop the learning content of the capacity building programme in order to inform, educate and encourage young people to take initiative as well as to push for successful innovative collective energy actions from young people in Europe - at both regional and local levels.

This deliverable, aligned with the context described, presents the details of the learning modules, the methodology used for them and the ways in which they can have an essential and optimal impact on the overall objectives of Task 4.1. It also constitutes critical input for all the knowledge and capacity creation activities of POWERYOUTH.

1.1. Purpose & Learning Objectives

The purpose of deliverable D4.1, is to provide comprehensive learning material for the POWERYOUTH capacity building programme. The POWERYOUTH learning modules presented in the current document aim primarily to foster the successful innovative and collective energy actions of young people in Europe, both locally and regionally. In addition, the findings of the literature-based research conducted for the development of the learning modules are expected to contribute to the development of the POWERYOUTH business models, as well as to support the implementation of energy communities and collective energy actions as described in the WP3 of the POWERYOUTH project.

The main objectives of this learning material are the following:

The learning modules aim young participants to:

- become familiar with the concept of energy communities;
- understand key terms related to the energy communities and the role of the citizens in the development of EC;
- learn about the main characteristics of energy communities and how they are crucial to fostering the energy transition; and
- gain knowledge on the stages necessary for the development of an energy community.

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Moreover, young participants of the training will gain an understanding on how important the role of youth is in the energy transition, and will be guided to comprehend the necessity of increasing youth engagement within energy communities. Young participants will also learn about how energy communities can be connected with the concepts of “Generation and Supply”; “Energy Efficiency”; and “Electro-mobility” and they will delve deeper into this through example cases.

Additionally, young participants shall be given information on why monitoring and evaluation are significant processes for the optimization of the operation of energy communities, as well as for maximizing the benefits energy communities bring to their members and the overall society. They will also learn about ways to make these processes more effective.

Last but not least, young participants on the programme, will gain knowledge on how to become initiators of an energy community and how to multiply the results of this training by becoming Youth Energy Ambassadors.

1.2. Deliverable Structure

The structure of this deliverable is as follows:

D4.1 includes five chapters. The first chapter introduces the scope of the deliverable and provides all the necessary introductory information needed for the training material. The second chapter briefly describes the process followed for the development of the training material, as well as its contents. Chapter three is structured into the sub-chapters following the content and the structure of the capacity building training material, as such:

3. Learning Modules structure and content

- 3.1. Part I: The concept of Energy Communities; Key characteristics & Preparation stages
- 3.2. Part II - The role of youth in the development of Energy Communities
- 3.3. Part III - Energy Community Modules
    - 3.3.1. Module 1: Energy Communities focused on “Generation and Supply”
    - 3.3.2. Module 2: Energy Communities focused on “Energy Efficiency”
    - 3.3.3. Module 3: Energy Communities focused on “Electro-mobility”
- 3.4. Part IV: Monitoring and Evaluation of an Energy Community
- 3.5. Part V: Becoming an Energy Community Initiator / Ambassador

Chapter four, following the information provided in chapter three, unfolds the key takeaways and conclusions from the training materials, while the last chapter – before the Annexes - include the references used. Lastly, this deliverable also includes a section of Annexes at the end of it. There, the final versions – before the local contextualization – of the capacity building training ppt sides and the follow up handbook are presented (see Annex I & II), followed by the list of questions used in the phase of monitoring and evaluation, in the form of a benchmarking survey and an evaluation questionnaire (see Annex III).

1.3. Methodology

The POWERYOUTH learning modules have been designed to address young audiences in the five pilot countries of the POWERYOUTH project. The material has resulted through an extensive literature review and desk research and the learning content has been shaped in a way that provides:

a) sufficient knowledge and details on the energy communities to the participants;
b) a thorough analysis on the importance of youth in energy communities;
c) detailed information on the energy communities under the three main areas of "generation and supply", "energy efficiency" and "electro-mobility";
d) as well as real cases from the pilot countries as examples of existing energy communities.

This material has been reviewed and approved by experts in the field of energy communities who have been onboarded in the POWERYOUTH capacity building as trainers and mentors for the young participants. In addition, the content of the learning modules has been designed to be flexible enough so that each pilot partner to be able to make adjustments and slight changes to it, to make it fit the country's local context best. The content of the learning modules has also been planned to be implemented as part of on-site capacity building activities of the project but it is designed in a way that allows it to be adapted for online capacity building activities, if necessary, too.

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2. Learning modules development process and materials

This chapter aims to provide an overview of the steps followed throughout the process of developing the learning modules material, as well as to provide a coherent list of the materials used for the completion of the learning modules.

2.1. Learning Modules development process

The content of the learning modules for the POWERYOUTH capacity building is the result of extensive desk research based on a broad respective literature. The literature used included official documents of the EU legislative framework on the energy communities, as well as relevant academic papers, reports and research materials.

An initial and indicative structure was then developed for the training material. This structure included the curriculum's units, the duration of each unit's presentation, the overall timing of the training's implementation, as well as the roles and responsibilities involved in its implementation, from the facilitators of the presentation to the experts onboard to act as trainers for the young participants.

After the structure of the learning material was drafted, it was circulated among the partners for their feedback and internal fine tuning.

Based on content resulting from bibliographic research and the parterns' follow up described above, the main content was built up, dedicated to cover the thematic areas of this capacity building training programme. These thematic areas, included:

a) generic information on the energy communities and their framework of operation;
b) information on the importance of youth in the energy transition and the development of energy communities;
c) information on different types of energy communities along with their cases, divided in the three focus areas of "generation and supply", "energy efficiency" and "electromobility";
d) horizontal information on the importance of monitoring and evaluation for the energy communities, as well as on the best ways to increase their effectiveness;
e) as well as information on the ways in which the young leaders trained within the POWERYOUTH capacity building programme, can proceed to taking over the roles of either Energy Community Initiators or Youth Energy Ambassadors, contributing this way in multiplying the effects of the POWERYOUTH approach across the EU.

When the capacity building training ppt slides were complete based on the above description, the material was once again circulated among the partners to provide their feedback and finetune the content.

In parallel, a follow-up handbook (see Annex II) with additional information on each of these units was developed to be distributed to the participants after the completion of the capacity building training.

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Along with this, a set of interactive activities were designed and integrated in the material of the capacity building training. Among the interactive parts of the training, a benchmarking survey and an evaluation questionnaire were developed for the participants to fill them out at the beginning and the end of the training respectively.

All of the material mentioned (content, including the training's ppt slides and the follow-up handbook, along with the benchmarking & evaluation surveys) were once again circulated among the partners in order to be assessed and improved.

Once all the key edits were completed, the material was sent for layout, to the partner responsible.

Lastly, the material was then ready to be slightly edited by each pilot partner separately in the phase of the final contextualization. Such contextualization was necessary to happen in terms of language translation, as well as in cases where appropriate additions to any of the thematic areas was considered necessary by the local experts onboard.

2.2. Learning Modules material

In this section, a presentation of the material used within the learning modules will be provided.

The material used for the POWERYOUTH capacity building programme includes:

a. The capacity building ppt training presentation
b. The follow-up handbook
c. The benchmarking questionnaire
d. The evaluation questionnaire
e. The certification of attendance

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3. Learning Modules structure and content

Chapter 3 “Learning Modules structure and content” of this deliverable presents the content studied and used for the development of the capacity building training material and the sources of it. In the first part, 3.1, regarding the concept of energy communities, their key characteristics and the preparation stages necessary for their development, the content unfolded includes input mostly extracted from the respective EU regulatory framework as well as from relevant reports from institutions working on the field of energy communities.

Section 3.2 addresses the role of youth in the development of energy communities, including the main information used in the capacity building programme to showcase to the participants why their initiative in the field is important. The aim of this part is to motivate young people based on documented information that can sufficiently justify why their involvement in the energy transition and the democratization of the energy field is so important.

Sub-chapter 3.3 focuses on the main learning modules developed within the training material, the energy community modules, and it is divided in three smaller parts, each of which exploring a different module, such as:

- Module 1: Energy Communities focused on “Generation and Supply”
- Module 2: Energy Communities focused on “Energy Efficiency”
- Module 3: Energy Communities focused on “Electro-mobility”

Every module includes information on the key elements of the respective types of energy communities, outlines their main activities, as well as presents examples of several active energy communities in the respective concepts (“Generation and Supply”, “Energy Efficiency”, and “Electro-mobility”), as examples.

Sub-chapter 3.4 presents the information used to explain to the participants, during the capacity building programme, why monitoring and evaluation are necessary processes for the improvement of operations of an energy community and how they can be best planned and implemented to optimize the community’s impact.

Last, sub-chapter 3.5, explains what it means to become an Energy Community Initiator/Ambassador and suggests ways on successfully. assuming this role

3.1. The concept of Energy Communities; Key characteristics & Preparation stages

3.1.1. The concept of Energy Communities

The concept of community energy reflects an increasing willingness in society to find alternative ways of organizing and running the energy systems. It is seen as a new form of social movement that enables more people to participate in these systems and fosters more participative and democratic energy processes. Until recently, the concept of community energy needed a clearer framework and status in EU and the national legislation [1], but currently the tendency is moving forward, and the necessary frameworks have been developed, as it is going to be explained as follows.

Taking the concept of community energy further, “Energy Community” is a term many people are still 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 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 is 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 [2].

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 delve 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)” – respectively.

Based on the first, DIRECTIVE (EU) 2018/2001 on the promotion of the use of energy from renewable sources [3], “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”.

Based on DIRECTIVE (EU) 2019/944 on common rules for the internal market for electricity [4], “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;

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(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 the concept of energy communities per se, it is important 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.

In that sense, based on DIRECTIVE (EU) 2018/2001 on the promotion of the use of energy from renewable sources, “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” [3].

While, based on DIRECTIVE (EU) 2019/944 on common rules for the internal market for electricity, “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” [4].

Based on the above, it can be summarized that energy communities are a form of collective citizen initiatives aiming to affect and eventually improve the energy system. In that sense, energy communities are legal 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, along with the ways energy communities 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" [3].

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 further promote and facilitate the development of renewable energy communities [3].

According to these provisions, "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;

(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;

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(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" [3].

Moving forward, 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 [4]:

(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, […], 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

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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" [4].

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" [4].

i. Differences in the definitions at the EU level

The European Commission's Clean Energy Package marks a significant advancement by explicitly recognizing, for the first time in EU law, the rights of individuals and communities to take an active role in the energy sector. It introduces legal recognition and specific frameworks for community-based energy initiatives, formally identifying certain types as "energy communities." Two key directives within this package outline these roles, as already presented above: the revised Renewable Energy Directive (EU) 2018/2001, which defines "renewable energy communities," and the updated Internal Electricity Market Directive (EU) 2019/944, which introduces the concept of "citizen energy communities" applicable to all forms of electricity [2].

These directives establish energy communities as a form of collective civic involvement in the energy landscape. The Electricity Market Directive (EU) 2019/944 clarifies that its provisions do not rule out other citizen-driven models based on private agreements. Both directives also permit different legal structures—such as cooperatives or associations—to be used to form these communities. These types of energy communities are treated as distinct, non-commercial participants in the energy market, combining economic activities with broader social and environmental goals. Among these, the (EU) 2019/944 citizen energy communities represent a novel entity type, characterized by unique membership and governance models. While the (EU) 2018/2001 content highlights specific local and ownership features of renewable energy communities. These definitions ensure that such communities are allowed to compete fairly in the energy market without facing discrimination, but also without disrupting competition or neglecting general market obligations [2].

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 – both types of communities share key principles. Governance within them must be inclusive and voluntary. The Renewable Energy Directive (EU) 2018/2001

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emphasizes equal access for local members, while the Electricity Market Directive (EU) 2019/944 ensures openness to all categories of stakeholders, and that households can freely join or leave these initiatives without losing their connection to the grid [2].

Regarding ownership and governance, both directives stress the importance of participation and control by individuals, local governments, and small entities whose core activities are not energy-related. Their main goal is not for profit generation, but rather to deliver community benefits—environmental, social, or both. Revenues should be mostly reinvested for community services. Member States are required to support the creation and growth of renewable energy communities through enabling policies, while also including them in renewable energy support schemes. In the case of citizen energy communities, the framework ensures a fair competitive environment as they enter the market as new actors. These communities can perform similar roles within the energy system, such as energy generation, distribution, consumption, storage, aggregation, and related services. However, they must follow the same rules and standards that apply to traditional energy actors—ensuring they meet these standards without bias [2].

In addition to the similarities noted above, Renewable Energy Communities and Citizen Energy Communities have some key differences between them that can be summarized as follows [2].

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

In more detail, the factors that are highly critical for the differences between the Renewable Energy Communities (REC) and the Citizen Energy Communities (CEC) can be listed as such [2]:

Geography: The Renewable Energy Directive (EU) 2018/2001 requires renewable energy communities to be based close to their energy projects, fostering local ownership. Conversely, the Electricity Market Directive (EU) 2019/944 places no such location restriction on citizen energy communities.

Scope of Activity: Citizen energy communities from the EU Directive 2019/944 may operate using both renewable and non-renewable electricity sources. Renewable energy communities from the EU Directive 2018/2001, however, focus specifically on renewable energy in both electricity and heating.

Membership: Citizen energy communities are open to many types of participants, provided that large commercial players from the energy sector do not dominate in the decision-making process. By contrast, renewable energy communities have stricter eligibility, limited to individuals, local governments, and small or medium enterprises not primarily active in energy markets. These communities must also ensure inclusion of lower-income or vulnerable households.

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Control Mechanisms: Renewable energy communities may be controlled by local small and medium-sized enterprises, while citizen energy communities restrict control from larger commercial entities. The Electricity Market Directive (EU) 2019/944 defines control as the ability to exert significant influence, whether through ownership or voting rights.

ii. 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 [2]:

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.

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.

Among the legal forms presented above, the energy cooperatives are the form most often used for the creation of an energy community. Here, some key elements of this type of energy communities are cited [5].

This type of ECs, the energy cooperatives, 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

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of education, training and information; the promotion of cooperation among cooperatives; as well as the common interest for the community in total.

iii. 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 on energy and sustainability related matters [6].

iv. Challenges and opportunities

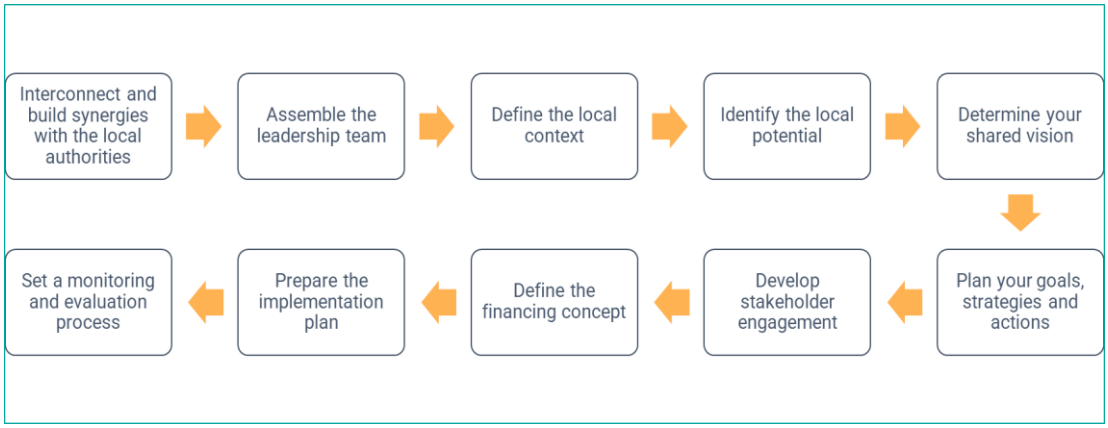
The development of an energy community often meets important barriers that might act as factors of discouragement for potential initiators, especially if they are young or not experienced enough. Such barriers include regulatory gaps and complex energy market rules that may make the process of development 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 [5].

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.

3.1.2. 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 learning modules provided a roadmap – a set of steps – to follow, so that a new youth energy community can become reality. These steps, partially developed based on prior similar approaches [5] & [7], as presented in the following 10-points flow, are briefly analyzed here, as such:



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, initiators will have to prepare by compiling a list of potential common objectives shared by the youth energy community and the municipality; it might be helpful to check in advance the municipality's action plan, if available, to do so.

In addition, initiators need to make sure to connect with the local authorities by contacting the right people in the appropriate roles. This way, they will be able to reach out for support and describe their intentions, plans and the reasons 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 the community. Further, it needs to be aligned with criteria of inclusive representation.

To achieve this step, the initiators need to start by building a group of young people with whom they share the same visions and values for the development of the energy community, define the structure of their energy community together and then allocate roles and duties among the members of the team. Doing so, they have to 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

The youth energy community will be based on the local context within which it will grow. Thus, it is necessary for those in charge to map the local landscape in advance. The initiators 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 too. To do so, the key economic activities taking place in the region; the level of energy poverty (if it exists); and the social and economic impact the energy community can have there must be defined.

Step 4: Identify the local potential

Along with the local context, initiators also need to identify the local conditions and the local potential which are crucial for the success of this project. In other words, proper mapping of the local energy demand, consumption and supply is critical.

Then, mapping 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) is a very important stage before the energy community initiation too.

Finally, mapping the local needs and defining if the focus of the energy community will be on generation & supply; energy efficiency or electromobility is crucial to happen.

Step 5: Determine the shared vision

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

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

Also, they need to define their priorities (for instance, minimizing environmental impact or tackling energy poverty) and make sure that these are part of a commonly shared vision within the rest of the team's members.

Step 6: Plan the goals, strategies and actions

In order to make the initiative both attractive and successful the initiators need to have clear objectives and strategies. To complete this step, they need to define the goals of the energy community in a specific and measurable form.

Then, it is suggested that they shall continue with planning a few alternative strategies to achieve these goals, taking into consideration the existing or potential challenges and barriers.

Moving forward, they have to define the main actions and then the key activities that are important to help achieve these goals.

At this stage, the legal form of the energy community that is being created has to be decided.

Step 7: Develop stakeholder engagement

Here, at this stage, some key steps are necessary to follow in order to maximize the project's impact. In that sense, it is important for the participants to define the local stakeholders they need to reach out to, lay out a specific communication plan and share their 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 the project.

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Step 8: Define the financing concept

To safeguard long term duration and viability of their project, the initiators need to make it viable and based on some solid financial ground. This can be achieved by determining the financial model of the energy community (such as, responding to the question whether it will be for profit or non-profit purposes, 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 for the initiators to identify financial potential or/and funding opportunities. This way, they can make sure they will have some minimum funding sources for financial security in the long run.

Step 9: Prepare the implementation plan

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

- Define the structure of the energy community.
- Set specific actions to be done towards achieving their 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 the 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 the activities of the community and that any adjustments of strategies/actions made do improve the community. At the same time, it has to be safeguarded that the progress is recorded and thus, that the success of the community can be 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 [5] & [7]:

1. Establishing the purpose of the energy community

The energy community initiators need to clarify whether the primary goal is to lower energy costs, generate income through energy production, or access clean renewable

energy. Then they have to decide if the community aims to be commercially viable or to operate as a not-for-profit. And of course, they need to collaborate with members to form a clear mission statement before moving on to operational steps.

2. Understanding permitted models in the region

As already mentioned, not all forms of energy production are legally permitted, or easily applicable, everywhere. This is why it is important for the energy community initiators 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. Thus, the initiators need to make sure to conduct detailed financial planning and analysis to select the structure most appealing to investors for their project, in their region.

4. Selecting Suitable Technology

Energy community initiators have to ensure that local energy production from their project will be tailored to the conditions of the area. Doing so, they need to make sure that they have carefully picked the right technologies and have determined the 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, initiators must pay attention at connecting with the right stakeholders, such as those people or SMEs in the region interested in getting involved; local authorities that might either benefit by the project or they may facilitate its progress; as well as with the competent DSO.

3.2. The role of youth in the development of Energy Communities

3.2.1. 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 mobilizers and energized citizens and their commitment to these causes are among the keys to a long-term success of any socio-technical transition [8].

In addition to this generic concept, research has also shown that there is a strong correlation between youth energy literacy and energy security. A correlation that is based on the fact that youth can have a central role in transforming the energy reality for specific communities. In particular, 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 transition as well. For instance, in rural communities it is renewable energy projects that can play a key role in democratizing energy. And in these very communities, the way young people are open and willing to understand and

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get involved with new technologies is a factor of added value for the local energy transition [8].

Consequently, allowing young people to lead the energy transition and to participate in renewable energy projects can lead to improved socio-economic conditions for the whole community, as well as to increased educational opportunities for all the young people of an area. At the same time such youth empowerment can contribute to the mitigation of the disproportionate and intergenerational effects of climate change on youth. 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 [8].

3.2.2. 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 so that they can get better-informed on such matters.

Hence, 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 areas, where youth comprise a large portion of the population, understanding perceptions and attitudes is essential to helping youth become sustainable energy consumers and adopters of renewable energy technologies.

That said, their participation in energy communities and in schemes fostering the energy transition and increasing awareness on its importance, is critical for shaping a motivated and well-informed generation of young leaders. 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 consumers, but they are also the group of people where future energy decision-makers will come from [9].

3.2.3. Energy consumption among youth

Apart from their ability to understand technology and hence, energy applications of it, youth are a group that constitutes energy intensive consumers. In parallel though, they are also quite 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, among whom also older members, in their social networks with energy-saving behaviors [10].

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3.2.4. Youth as drivers of change in Energy Communities

Youth have always been drivers of change throughout a variety of socio-economic situations over time. Now, once again they have the potential to play the same critical role in energy democratization, by actively engaging in energy communities. Some of the key elements that make youth act as drivers of change towards this direction can be summarized as such [8]:

-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, as well as processes that can revolutionize how energy is managed and distributed.

-Sustainability mindset

Young generations are more conscious of climate change and the overall environmental impacts of human activities, among which energy production and consumption. This is a necessary way of thinking for the transition on a sustainable future that aligns properly with the goals set on increasing the use of renewable energy sources.

-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 to support start-ups and innovation focused on clean tech solutions.

3.2.5. Youth as long-term stakeholders and sustainability advocates

Young people – even if it sounds as a cliché – have their whole future lying ahead of them. If they remain committed to the goal of a green, just and inclusive energy transition, they will be critical long-term factors of change and they will have the ability – if properly empowered – to shape the future of 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 a result, building strong foundations with youth today, leads to safeguarding that energy communities continue thriving into future generations as well.

In addition, including young people in democratic schemes, such as the governance of energy communities, can also have important long-term social value. Youth-led initiatives can focus on inclusive decision-making processes, while creating leadership roles within energy communities for youth. These processes ensure their proper representation and support 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, which can include the just and inclusive schemes of collective energy production within an energy community [8].

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3.2.6. 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 their 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.

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 initiatives for technology transfer and Research & Development opportunities [9].

3.2.7. 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, such as organizing workshops, webinars, and community forums that can be used to educate more young people on clean energy practices and community building.

Youth have shown that they can initiate campaigns that require 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 and digital tools with competency.

One of the most well-known examples regarding the youth's persistence to show up when raising awareness is necessary, is the case of Greta Thunberg-inspired global youth-led climate strikes that illustrate the power of youth advocacy. Also, youth energy forums or networks for sharing best practices and knowledge, especially on the fields of energy and sustainability, are also becoming more and more known and valued over the latest years [8].

3.2.8. 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 [8].

As a result, youth contribute to 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.

3.2.9. Youth in the multi-lateral energy space

All of the above are some of the reasons that make youth so crucial in the energy transition and increase the importance of their role 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 energy communities capable of becoming the administrators of their own energy production and consumption, the role of youth is essential for the overall process of the just energy transition [8].

3.3. Energy Community Modules

3.3.1. Module 1: Energy Communities focused on "Generation and Supply"

Energy communities consist of citizens, businesses, and public institutions working together to generate, manage, and use energy. These groups play a key role in advancing decentralized energy systems, enhancing local energy self-reliance, and strengthening community involvement in the energy transition. Common activities within these communities include energy production, distribution, consumption, supply, and storage.

In the first module of Part III of this training, the foundational characteristics and operations of energy communities, particularly those centered around generation and supply are developed.

Main elements

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 [5] & [11]:

Energy security and resilience

By producing energy locally, communities reduce their dependency on outside sources, bolstering their capacity to withstand external shocks such as supply disruptions or volatile market prices. This localized resilience improves the overall reliability of the energy system.

Decarbonization efforts

Energy communities are the most effective 'tool' at the hands of citizens and communities to contribute to the decarbonization of the energy sector. They can empower people to actively support the reduction of carbon emissions in the energy sector as they are instrumental in promoting renewable energy sources and reaching national and international climate targets.

Benefits in the local economy

Community-based energy projects focused on generation and supply often stimulate local economies by generating employment and encouraging investment. Initiatives like installing solar panels or wind turbines can lead to job creation and provide opportunities for training in new skills. Moreover, profits from energy generation are frequently reinvested into community development or used to lower energy costs for members.

Democratic participation in the energy transition

Initiatives like the energy communities promote participatory governance, giving community members a direct role and voice in energy-related decision-making and reinforce democratic engagement in the energy transition overall.

Lower energy costs

By producing and consuming energy collectively, the members of energy communities often benefit from lower utility bills and are less exposed to fluctuations in the prices dependent on the energy market.

Ownership and control

Energy communities are usually owned and operated by citizens, with involvement from local authorities or small businesses as stakeholders on some occasions. This ensures that decisions are made democratically, with members actively participating in the governance of the community.

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 mainly for local consumption, fostering autonomy and sustainability. Energy is then supplied directly to the community members, promoting self-sufficiency.

Energy sharing mechanisms

The energy surplus, in such communities, can either be distributed among community members or sold to the grid. These mechanisms not only create environmental

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advantages but also help generate revenue that can support further community initiatives.

Non-profit orientation

Many energy communities operate on a non-profit basis, prioritizing social and environmental benefits and embracing a mission-driven, not-for-profit model over profit-making.

Collective investment and infrastructure sharing

Members often pool resources to fund infrastructure such as microgrids, heating networks, or additional renewable energy installations, enabling broader access and long-term sustainability.

Activities of energy generation and supply in energy communities

The primary functions and activities carried out by energy communities focused on generation and supply of energy are outlined below [5] & [11].

Energy generation

One of the most common undertakings of energy communities is the deployment of renewable energy infrastructure—such as solar panels, wind turbines, or geothermal systems. These installations aim to harness local renewable resources efficiently, depending on the geographical and environmental conditions of the area, to help transition to a decarbonized energy system.

Energy supply and distribution

Energy communities may also take on the role of energy suppliers, providing electricity or heating directly to their members or neighborhoods. This can include examples on the development of localized microgrids or the sale of surplus energy to larger grid systems under contractual agreements.

Collective self-consumption models

The energy produced by the community is often consumed collectively among its members, allowing for reduced energy costs and improved energy independence. This typically relies on mechanisms like virtual net metering or net billing, depending on each region's policy framework and regulatory structure.

Innovative energy management systems

To make their operations more efficient, many energy communities incorporate technologies such as smart grid systems, digital monitoring tools, and demand-side management solutions. These innovations enhance the coordination of energy generation and distribution within the community.

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

OurPower Energy Cooperative (Austria)

OurPower [12] & [13] is an energy cooperative, founded in Vienna in 2018, aiming at engaging citizens in the electricity market. It constitutes an ideal example of how community members can be empowered locally, to collectively take on roles regarding the energy generation and supply as active citizens. In particular, OurPower 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 marketplace 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.

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)

Coopérnico [5] & [14] is Portugal's first renewable energy cooperative and an additional example of empowering citizens to take on active roles on RES production and energy supply, since Coopérnico has been 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".

In fact, 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. Something that makes Coopérnico's operation and potential even more significant for the local context.

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

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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.

3.3.2. Module 2: Energy Communities focused on "Energy Efficiency"

Energy communities typically concentrate on producing renewable energy, supplying it to members, and enhancing energy efficiency. Their core objective is to empower people to have greater control over how they produce and use energy, thereby promoting local self-reliance and advancing environmental sustainability. As such, improving energy efficiency is a key focus area for energy communities.

Most commonly, energy communities focused on energy efficiency aim to achieve several goals: cost savings; environmental benefits; energy security; improving energy resilience and generating local community benefits.

Cost savings can be achieved by reducing energy waste and allowing energy communities to lower electricity bills for their members. At the same time, greater efficiency contributes to cutting greenhouse gas emissions, supporting climate targets. In addition, considering that when energy demand is decreased, the resilience to market fluctuations and disruptions in supply is strengthened, energy efficiency is an important factor for achieving energy security too. Moreover, encouraging residents to participate in energy efficiency actions promotes a sense of community and shared environmental responsibility [5].

Main elements

This section briefly outlines the essential features and main elements of energy communities focused on efficiency [11]:

-Participatory governance

Members actively engage in decision-making processes regarding managing 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 improvements, and then implement measures such as improved insulation, installation of smart meters to track energy usage, energy-efficient lighting, or other energy storage solutions.

-Education and awareness campaigns

Energy communities often initiate campaigns and programs for promotion of the understanding of energy issues and promotion of more responsible and energy efficient behavior in the homes and businesses of the members.

-Demand response programs [15]

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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.

Activities of energy efficiency in energy communities

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 improving the overall energy performance of buildings. These efforts frequently involve upgrades or renovations to existing structures. Upgrades such as better insulation, installation of energy-efficient windows, and other retrofitting improvements can help boost building performance and contribute directly to the community's energy-saving objectives [5].

In addition, the adoption of intelligent energy management systems plays a crucial role in achieving efficiency gains. By employing smart technologies, communities can track and adjust energy usage in real time for optimal performance. 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. Economically, communities often experience lower collective energy costs and improved access to financial incentives or government subsidies—benefits that are particularly significant for the vulnerable households benefited by the energy communities [5].

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 the generation of renewable energy locally. These communities play a key role in minimizing GHG emissions and achieving climate targets on energy sustainability [16] & [17].

As defined by the U.S. Department of Energy, "a net zero energy community (NZEC) is an energy-efficient community where, on a source energy basis, over the course of a year, the delivered energy is less than or equal to the onsite renewable exported energy". The respective literature suggests that evaluating a net-zero energy community (NZEC) should involve four main considerations [17]:

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a) The community should be powered by a central energy system primarily based on renewable energy sources, capable of meeting the total energy demand.
b) Energy transmission losses must be taken into account to ensure efficient energy delivery.
c) The community's financial structure and cost implications should be assessed.
d) The environmental consequences, particularly greenhouse gas emissions, should be evaluated as part of the overall impact.

Based on the definitions provided, the central goal of NZECs is to achieve a net zero energy balance. To achieve that NZECs aim at optimizing energy efficiency and generating renewable energy locally at the same time. This way, they hold an important role in eliminating GHG emissions and supporting climate targets on energy sustainability. In that sense, some of the key benefits of NZECs include [17]:

- 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

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.

The main ways of achieving the goal of NZE on a community level include a variety of practices and characteristics. It is not only regarding generating the required energy from renewable energy sources but it is also about reducing the energy demands by improving the microclimate, which is one of the factors affecting the building energy performance. In addition, it is also important to foster incorporating passive energy efficient elements within the buildings of the settlement on each occasion. Under that prism, some of the methods necessary to serve the NZE purpose at the community level include [17]:

- Reducing external heat sources to enhance the local microclimate during periods of high temperatures.
- Modifying building design to optimize indoor thermal comfort and improve energy efficiency
- Integrating renewable energy systems to supply the community’s energy needs.

Additionally, the implementation of energy saving practices such as lowering energy consumption through efficient lighting, appliances, building insulation, and thermal performance significantly reduces the amount of energy required from renewable sources.

To achieve this level of energy efficiency, Net Zero Energy Communities (NZECs) commonly implement a variety of strategies [17], including:

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- Building interventions and structural upgrades, such as enhancing insulation, installing high-performance windows, and improving ventilation systems, which help minimize energy loss and reduce demand for heating and cooling.
- Promoting energy-conscious behavioral changes by informing and motivating residents and energy users to adopt energy-saving habits through educational initiatives and real-time feedback mechanisms.
- Implementing smaller-scale efficiency measures, like using low-energy appliances and LED lighting or the deployment of energy-efficient devices, which lower overall energy consumption while maintaining user comfort and convenience.
- Integrating advanced technologies by pairing energy-saving measures with on-site renewable energy systems, thereby maximizing their combined effectiveness and benefits.

Within the Net Zero Energy Communities (NZECs) several technologies can be developed either for energy production or for energy management. Among these, the most essential ones can be summarized as follows [17]:

Systems for Renewable Energy Production

- Solar Photovoltaic (PV) Panels: These are commonly installed on rooftops of homes, public buildings, or shared community areas, converting sunlight directly into electrical energy. Their popularity has grown rapidly due to their decreasing cost and adaptability to various scales.
- Wind Turbines: Where wind resources are adequate, small to medium-sized turbines are used to generate electricity, complementing other energy sources and supporting local supply.

Energy Storage Mechanisms

- Battery-Based Storage Systems: These systems capture surplus of energy generated during periods of high output and store it for later use, thus helping to regulate the flow of energy and match supply with demand.
- Thermal Energy Storage: Renewable heat can be accumulated during off-peak times and utilized later for heating needs, effectively lowering dependence on fossil-fuel-based energy sources.

Advanced Heating and Cooling Systems

- Heat Pump Systems: Utilizing either air or ground as a heat source, these systems efficiently manage indoor temperatures by transferring heat from one place to another, minimizing the energy use.
- District Heating Networks & Infrastructure: This approach involves centralized generation and distribution of heat to a cluster of buildings from one highly efficient energy plant, optimizing heating at the neighborhood level.

Smart Energy Management Tools

- Smart Meters: These provide users with real-time data and insights into their energy use, empowering them to make informed adjustments for improved efficiency.

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- Comprehensive Energy Management Systems (EMS): These automated systemic solutions control and coordinate energy generation, storage, and consumption to ensure seamless optimization and balance.
- Demand Response Programs: By allowing users to shift or scale down electricity usage during peak demand periods, these programs help reduce pressure on the grid and enhance overall energy efficiency within the community.

M2: Energy Communities focused on "Energy Efficiency" - Case Studies

Spółdzielnia Energetyczna Eisall (Poland)

Spółdzielnia Energetyczna Eisall [18] & [19] 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 ensuring stability of energy supply. Among its activities, the cooperative puts emphasis on providing consultation and supporting the community members to optimize their energy use and to increase their self-sufficiency.

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 provides recommendations on 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 (in cooperation with Neo Energy Group).

Claremorris and Western District Energy Co-Op (Ireland)

Claremorris and Western District Energy Co-Operative [20] 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 and solutions. Among the co-operative's core objectives, energy efficiency is highlighted, since the activities developed by it include important building interventions to improve the energy consumption status of its members.

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 about 5MWe solar sites which are completely community owned and has won the Renewable Electricity Support Scheme (RESS1), which provides support to renewable electricity projects in Ireland, as the first of one 100% community owned sites in the country. 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.

3.3.3. Module 3: Energy Communities focused on "Electro-mobility"

Energy communities bring together citizens, businesses, and local authorities to collectively engage in various energy-related activities, among which electro-mobility is often included [5].

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 their 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 [21].

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 [21].

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 [22].

Main elements & Activities

Here, in this part, the key elements of energy communities with activities focused on EVs are briefly explored along with the ways they are connected to particular activities that often take place within the energy communities:

- Collective planning and investment [23]

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

- Integration with RES [23]

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

- Public awareness and trainings [24]

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

- Shared use models [24]

Sharing models such as 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 [25]

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 of 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 [26].

Also, in order to reduce the emissions of the transport sector there will have to be a critical reduction on individual car use and switch to electric and shared ones. 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-based energy project.

A cooperative can invest in a system of EVs where people can book and use. This approach shifts car ownership from individuals to the community, enhancing community engagement in the transport sector. Besides, the whole experience of car sharing is a more communal experience, allowing people to reduce reliance on private 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 their own community, like tools to open cars without keys [27].

Every cooperative enterprise engaged in sharing electric cars can also 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 utmost 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 [23].

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 coordinated accordingly. Finally, EVs flexibility can also reduce the need for new power generation and lower the grid infrastructure costs eventually [23].

EVs integration and grid stability

It is useful to highlight the connection between EVs integration and grid stability which is highly affected by the following factors [23].

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 new EV charging load related challenges make accurate EV charging load prediction and management critical. Without effective management, peak hour electricity demand could compromise the stability and safety of the grid. In addition, there is an extensive need for methods 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 an 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” - Case Studies

Tilos Island Energy Community (Greece)

The Tilos Island Energy Community offers a good example of how electro-mobility can be integrated into the activities of an energy community. As is further explained below, Tilos has developed important activities to foster a just and inclusive energy transition, among which, the initiation of an electro-mobility plan, with EVs and infrastructure, to modernize both public and private transportation.

Tilos [28], 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 population of ~830 registered inhabitants, and the winter period suggesting an even lower number, at around 500. On the other hand, the hosting

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capacity of the island during the summer months is extended to several thousands of 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.

3.4. Monitoring and Evaluation of an Energy Community

3.4.1. The importance of monitoring and evaluation in energy communities

The key factors explaining why monitoring and evaluation (M&E) 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, continuous improvement relies heavily on monitoring and evaluation which 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.

3.4.2. 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 [29]

The use of smart metering systems[1] 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 [30]

To monitor the environmental impacts of an energy community carbon footprint measurement is a good solution that allows 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.

[1] According to the DIRECTIVE (EU) 2019/944 on common rules for the internal market for electricity: 'smart metering system' means an electronic system that is capable of measuring electricity fed into the grid or electricity consumed from the grid, providing more information than a conventional meter, and that is capable of transmitting and receiving data for information, monitoring and control purposes, using a form of electronic communication; 'conventional meter' means an analogue or electronic meter with no capability to both transmit and receive data.

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Economic metrics [30]

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 to measuring how long it takes for energy investments to become profitable.

Social impact metrics [30]

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.

3.4.3. Evaluation methods

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

Baseline and benchmarking analysis [31]

To conduct a proper evaluation, it is critical to start by setting a baseline, a point that establishes initial data for comparison over time. Benchmarking is equally essential, 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) [32]

KPIs of various types are crucial to evaluating the progress of an Energy Communityand can represent this progress in a variety of fields.

Energy KPIs are used to showcase the level of energy efficiency of a project under assessment, how it promotes self-generation and self-consumption, if it fosters self-sufficiency and several more factors related to the energy generation, distribution, storage and use.

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.

Some indicative examples of each category of KPIs are provided here as such [32]:

Energy KPIs

- Electrical Self-Production Rate (ESP): Ratio between the total amount of electrical energy produced on the site and the electricity demand (%).
- Total Energy Used (TEU): Energy supply from local resources inside the community and distribution network-based supply from outside (kWh).

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- Self - Consumption Rate (SCR): Ratio between the electrical energy self-consumed and the electrical energy produced within the REC (%).

Environmental KPIs

- Environmental Impact (ENVI): Environmental Impact in terms of kg per year of avoided X-specific pollutant (%).
- Low carbon Public Transportation Vehicles deployment rate (LPTV): Assessment of the deployment rate of low carbon technologies for transport (%), based on the sum of total public vehicles, and the number of low carbon vehicles within the REC.
- GHG Emissions (GHGE): GHG emissions (carbon footprint) in the community (kg of CO2-eq.) as the sum of the CO2 emission from production, operation and transportation of energy within the REC.

Economic KPIs

- Annual Energy Cashflow (AEC): Difference between the total yearly income and the expenses incurred for energy consumption and production (€/year).
- Capital Expenditure (CAPEX): Initial costs incurred for the development, construction, and installation of infrastructure and equipment necessary to generate, store, and distribute renewable energy (€).
- Economic Sustainability Factor (EF): Comparison between project incomes and the system costs (%), based on the number of years.

Social KPIs

- Local Representation (LR): Assessing the representativeness of the people constituting the local governance team (%). The results is based on the number of REC members feeling representative by the governance team, and the total number of REC members.
- Social Energy Empowerment (SEE): Percentage of the population feeling responsible for their own energy consumption (%).
- Citizens' Satisfaction (CS): This KPI is measured using surveys, to indicate the level of satisfaction of the population due to RECs measures. It is being assessed in the percentage of the population surveyed that is satisfied (%).

Qualitative evaluation methods [31]

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.

3.4.4. 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. Defining (SMART) goals (specific, measurable, achievable, relevant, and time-bound) is necessary to develop customized KPIs aligned with these objectives, covering environmental, economic, and social outcomes [30].

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 [31].

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 [31].

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 very important to enhance collaboration with policymakers to ensure that the community remains aligned with evolving regulations and goals [31].

3.5. Becoming an Energy Community Initiator / Ambassador

POWERYOUTH is a dynamic initiative designed to empower the next generation to become active agents of the energy transition. Its core mission is to equip young people with practical tools, knowledge, and skills that enable them to take on leadership roles in reshaping local energy systems. By placing youth at the heart of the transition, POWERYOUTH ensures that young voices are not only heard but also instrumental in designing and driving sustainable energy solutions.

In that direction, the capacity building programme encourages young participants to take on two pivotal roles, to become either Energy Community Initiators or Young Energy Ambassadors. Together, these two roles form a complementary strategy for building a resilient and youth-driven movement for a just and inclusive energy transition across Europe.

3.5.1. What is the Energy Community Initiator

Energy Community Initiators are young individuals who, after actively participating in the co-design and development of POWERYOUTH's replication strategies, are encouraged to deepen their engagement beyond the life of the project. As Energy Community Initiators, they are expected to lead the formation of new local energy communities, catalyzing innovative business opportunities and fostering grassroots ownership of the energy transition. They play a foundational role in translating the project's learnings into real-world impact by initiating tangible, community-led energy solutions.

3.5.2. What is the Young Energy Ambassador

On the other hand, Young Energy Ambassadors are envisioned as influential communicators and facilitators who will extend the reach and visibility of the POWERYOUTH approach. Through their involvement in the project's development

stages, they gain expertise and confidence to become advocates for energy sustainability. Their role is to amplify the project's messages, inspire peers and citizens to take part in community energy initiatives, and help scale up the model across Europe. By acting as multipliers, they contribute to achieving the actions and goals that the POWERYOUTH project has foreseen among its results, while they also contribute to the broader societal shift towards clean energy, inclusion, and climate action.

3.5.3. How to become Initiators and/or Ambassadors

The POWERYOUTH approach offers a targeted capacity-building program based on the learning modules and designed to equip young individuals with all the necessary information for motivated young people to become empowered enough to step into the roles of either Energy Community Initiator or Young Energy Ambassador.

This comprehensive training goes beyond theory. It includes hands-on learning through a practical simulation exercise, in which participants are challenged to develop a real case of an energy community initiation plan using the POWERYOUTH toolkit. This interactive activity, as a component of the training, ensures that participants gain not only conceptual understanding but also the ability to apply their insights in practical contexts.

After the training is complete, participants are empowered to act as changemakers. They are encouraged to share what they have learned, inspire their peers, and take proactive steps to replicate the POWERYOUTH approach in their own communities or networks. This peer-to-peer dissemination model is a vital part of the project's long-term vision—ensuring that the knowledge and energy of the first cohort of trained young leaders can continue to spread, multiply, and build momentum across Europe.

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4. Conclusion

As closing remarks, it is important to highlight that the POWERYOUTH leaning modules are aiming to successfully deliver the essential knowledge base and practical tools required to prepare young individuals to take meaningful action in the energy transition, particularly through their involvement in youth-led energy communities. The learning modules, translated to a full capacity building programme, place a strong focus on empowering participants and equipping them with the confidence and skills to engage with local stakeholders, underlining the pivotal role that young leaders play in driving sustainable and community-led energy initiatives.

Among the most critical insights drawn while drafting this learning material is that involving young people in energy communities is not just advantageous, but vital for promoting innovation, inclusivity, and sustainability. Their involvement drives innovation, ensures a more inclusive process that leaves no one behind, and supports long-term sustainability. By addressing these modules in the capacity building programme, young participants will be able to hold a solid understanding of the defining elements and guiding principles of energy communities, the legislative and policy frameworks that support them, and the hands-on processes required to create and maintain a successful energy community project. Additionally, the trainees will be introduced to how energy communities intersect with various areas such as electricity generation and supply, energy efficiency, and electromobility. These topics will provide them with a broader comprehension of how integrated approaches within these domains can accelerate the shift toward a low-carbon energy system.

A significant outcome of the programme lies in its dedication to youth empowerment and leadership development. By gaining such expertise, participants will be ready to take on key roles as Energy Community Initiators or Young Energy Ambassadors — helping to scale the impact of the POWERYOUTH methodology far beyond the initial pilot regions and seeding a wider movement across Europe.

Looking ahead, active engagement, mentorship, and collaboration will be critical to maximizing the impacts of the capacity building training. The continued success of this initiative will depend on nurturing this level of active engagement, while providing mentorship, and fostering collaborations. To unlock the full potential of POWERYOUTH it is essential to value and sustain the initiative through continuous policy advocacy, financial support mechanisms, and community-driven projects that allow young people to lead the transformation toward a more just, decentralized, and sustainable energy landscape.

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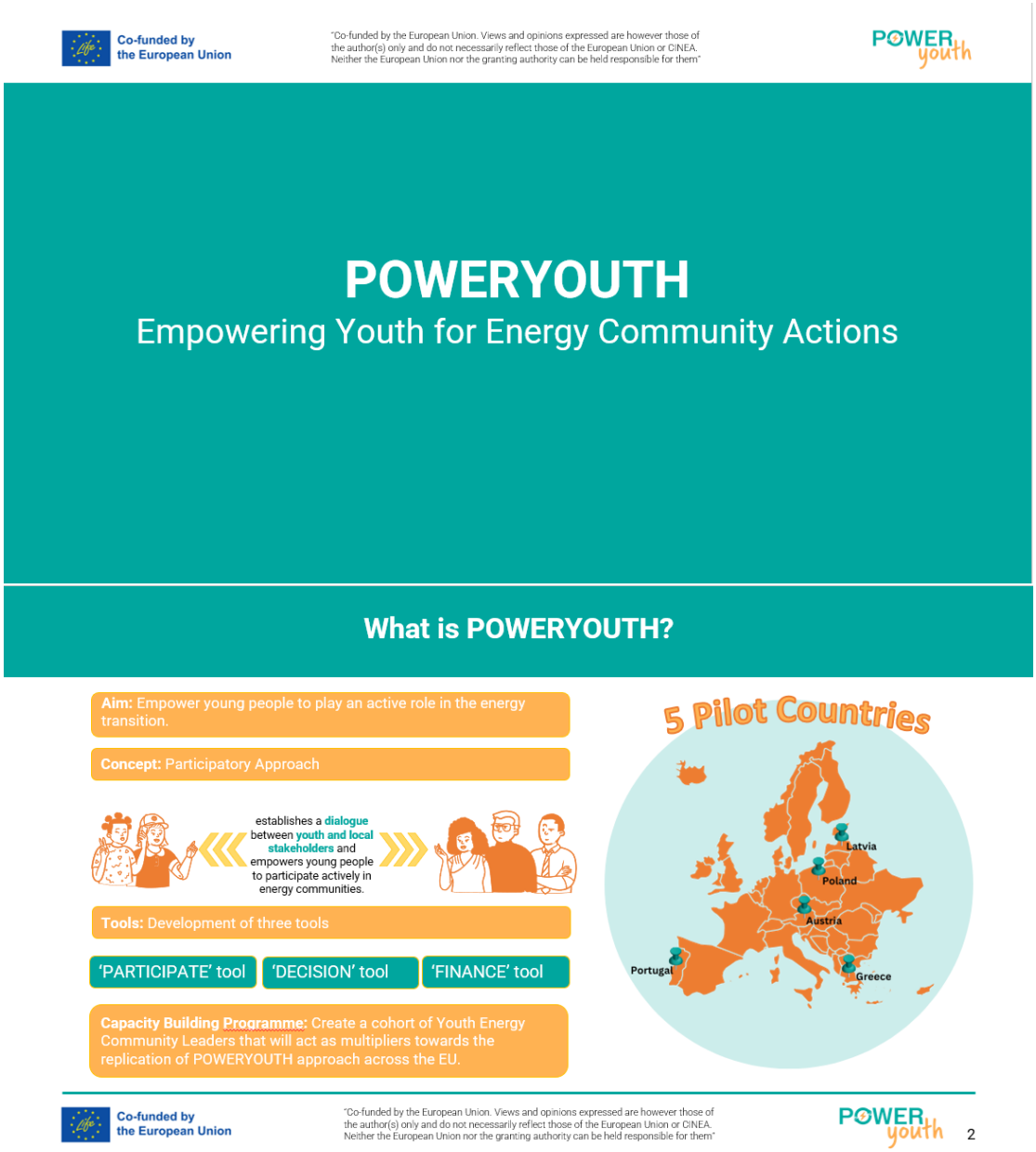
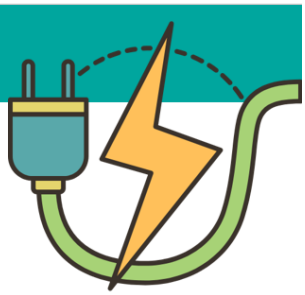
Annex I

POWERYOUTH training ppt slides

You can find the whole POWERYOUTH training presentation here.



Benchmark Survey



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Training Curriculum

- 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

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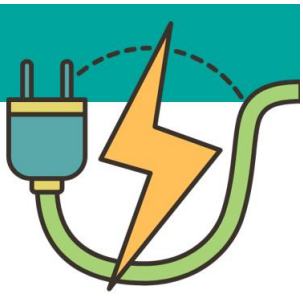
Learning Objectives

- Introduce the concept of Energy Communities
- Present the main characteristics of Energy Communities
- Present the preparation stages for developing an Energy Community
- Highlight the importance of youth engagement in Energy Communities
- Description of the Energy Community modules:

  M1: Introduce the Energy Communities focused on "Generation and Supply"
  M2: Introduce the Energy Communities focused on "Energy Efficiency"
  M3: Introduce the Energy Communities focused on "Electro-mobility"

- How to monitor and evaluate an Energy Community
- How to become an initiator of an Energy Community /a Youth Energy Ambassador



Part I

The Concept of Energy Communities
Key characteristics & Preparation stages

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The Concept of Energy Communities
Key characteristics & Preparation stages

An Energy Community is an **autonomous** legal entity that operates **based on open and voluntary participation** of people, SMEs or local authorities based in their majority, in the same region the community is established. Those members of the Energy Community are the ones controlling its operation.

The main purpose of an Energy Community is to provide environmental, economic or social community benefits.

An Energy Community may engage in activities like **energy generation, distribution, supply, consumption, aggregation, storage, energy efficiency services or charging services for electric vehicles or provide other energy services** to its members or shareholders.

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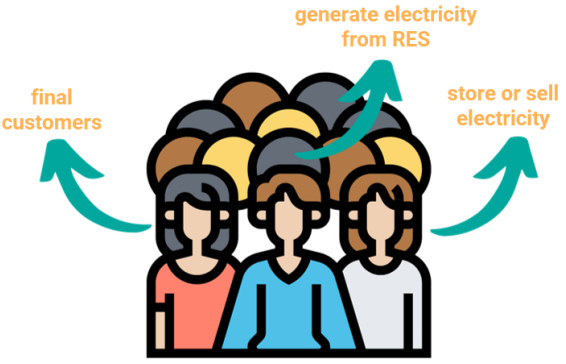
The Concept of Energy Communities
Key characteristics & Preparation stages

The role of citizens in Energy Communities

The citizens in Energy Communities are the **final customers** and at the same time they can be the ones **generating electricity from RES for self-consumption**, or the ones **storing or selling self-generated electricity**.

In case of selling this self-generated electricity, this activity cannot be the primary commercial or professional activity of the citizen within the Energy Community.



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The Concept of Energy Communities
Key characteristics & Preparation stages

Here's a depiction of how the EU sees a "greentown". A town based on Renewable Energy.
Source: https://energy.ec.europa.eu/energy-explained/interactive-infographics/infographic-renewables_en

GREENER BUSINESSES	CITIZEN INVOLVEMENT	ENERGY SECURITY	ENERGY STORAGE	JOB CREATION
Renewables help reduce emissions from industry by reducing the use of polluting fossil fuels. By generating renewable energy or buying it directly from producers, businesses can play an active role in the energy transition.	Europe encourages communities and consumers to play an active role in the energy market by becoming producers themselves (prosumers) or to take shares in energy cooperatives.	With Greentown's grid connected to its neighbours, they can share their surplus renewable energy with each other and be less likely to face blackouts.	Wind and solar production naturally vary, so batteries help Greentown store electricity and stabilise its energy supply. Large aquifers can store renewable heat underground. Renewable hydrogen and pumped hydropower are other options.	From electricians to environmental engineers, from builders and project managers to IT and transport specialists: renewable energy brings skilled jobs to Greentown folks!

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The Concept of Energy Communities
Key characteristics & Preparation stages

Here's a description of what Energy Communities are, by the StartSun Project.

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The Concept of Energy Communities
Key characteristics & Preparation stages

Differences in the definitions at the EU level

Renewable Energy Community (REC)	Citizen Energy Community (CEC)
• All forms of renewable energy	• Technology-neutral (only electricity)
• Proximity of RE projects	• No geographic limits
• Individuals, local authorities and micro/small/medium enterprises	• Any participant
• Autonomous from individual members and traditional market actors	• Undefined degree of autonomy
• Effective control by individuals, local authorities and micro/small enterprises	• Effective control includes medium-sized enterprises

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11

The Concept of Energy Communities
Key characteristics & Preparation stages

Key characteristics – Legal forms

Legal Structure	Description
Energy cooperatives	**The most common and fast-growing form of energy communities.** This type of ownership primarily benefits 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 (e.g., for-the-public-good companies).
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.

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The Concept of Energy Communities
Key characteristics & Preparation stages

Energy cooperatives

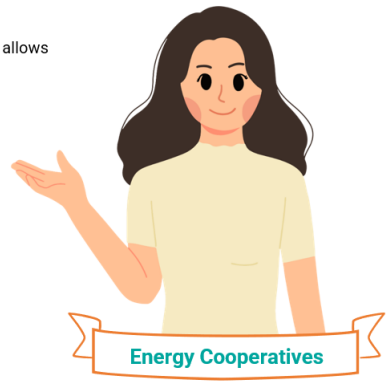
Energy cooperatives are types of social and economic enterprises. This legal form allows citizens to collectively own and manage energy-related projects and services

Their key elements:

- Democratic governance (1 member – 1 vote)
- Citizens can consume and share energy from RES
- People can invest by buying shares or financing projects
- Surpluses are reinvested to support the members and/or the community

Their key principles:

1. Voluntary and open membership
2. Democratic member control
3. Member economic participation
4. Autonomy and independence
5. Education, training and information
6. Cooperation among cooperatives
7. Concern for community



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The Concept of Energy Communities
Key characteristics & Preparation stages

Key characteristics – Consumer's comfort & ease

Energy communities enhance consumers' comfort and ease by:

- Personalized/community-based energy solutions
- Cost savings and energy security

Key benefits

- Stable and reliable energy supply
- Community-based demand management
- Social and Economic Inclusion
- Education and Awareness

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The Concept of Energy Communities
Key characteristics & Preparation stages

Key characteristics – Consumer's challenges & opportunities

CHALLENGES

- **Regulatory barriers** and complex market rules can hinder energy community development and operations.
- Initial investment and funding requirements are often **very high**.
- Participating in an energy community may **require access to technical expertise** and technology for the members.

OPPORTUNITIES

- Energy communities often receive **support** from the EU and national governments, with **access** to **innovative financing solutions** like crowdfunding and grants.
- These communities boost citizen **awareness and public support** for green initiatives.

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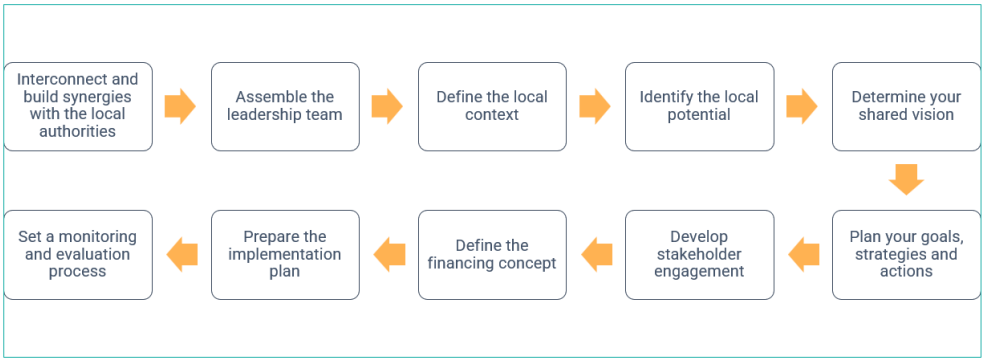
The Concept of Energy Communities
Key characteristics & Preparation stages

Preparation stages

General timeline/steps to follow as a roadmap



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The Concept of Energy Communities
Key characteristics & Preparation stages

Preparation stages – Business Plan

A business plan for an Energy Community should include (at least) the following steps:

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.
- Decide if the community aims to be commercially viable or operate as a not-for-profit.
- Collaborate with members to form a clear mission statement before moving on to operational steps.

Understanding Permitted Models in the Region

- Not all forms of energy production are legally permitted everywhere.
- Gaining a strong grasp of relevant regulations is crucial.
- Seek expert guidance or conduct an assessment to begin with an appropriate model.

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The Concept of Energy Communities
Key characteristics & Preparation stages

Preparation stages – Business Plan

Evaluating Financial Options for Various Models

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

Selecting Suitable Technology

- Ensure that local energy production is tailored to the conditions of the area.
- Carefully pick the right technologies and determine suitable sites for building the community power infrastructure.

Create a network of stakeholders

- Connect with people or SMEs in the region interested to get involved
- Connect with the local authorities
- Connect with the DSO

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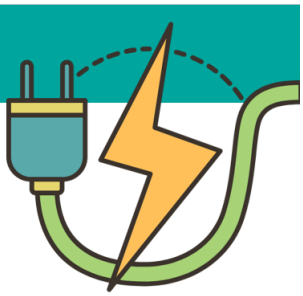

Game in Energy Communities (20 min)

Activity I: Reschool Community Game

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What is the Reschool Community Game?

Definition: A fun card game where players compare values on their cards to win.

Goal: To collect all the cards by winning individual rounds, by having the highest stat each round.

Number of Players: 2-5

Game Components: 32+ cards; Instruction card, Icon explanation card

Playing Time: 5-10 minutes

Why RESCHOOL Energy Community Card Game?

- Engaging and competitive.
- Easy to learn and play.
- Introduces energy communities and their goals (developed in collaboration with schools, experts, and energy communities.
- Promotes strategic thinking and knowledge about clean energy and community action.

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The Cards and Set Up

What's on a Card?

- A title or name of an Energy Community.
- Categories with numerical values (e.g. installed capacity, gender balance, etc.)
- An image for context or appeal.
- Each card features six attributes and additional icons representing their activities.

How to Set Up

- Shuffle the cards thoroughly.
- Deal them equally among players.
- Keep your cards face down; no peeking!
- Tip: If players are uneven, form small groups and share decision-making.

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How to Play a Round

Starting Player:

- The player to the left of the dealer (or choose randomly).

Choose a Category:

- The starting/acting player picks one category from the top card.

Compare Values:

- "All players reveal the value of the same category from their top card. The highest value wins the round, except in the case of 'Gender Diversity,' where the value closest to 50% wins, and 'Founding Year,' where the furthest value wins."

Collect Cards:

- The winner takes all the cards and places them at the bottom of their deck.

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Special Situations and Winning the Game

Tie:

- In case of a tie, the acting player picks another attribute to compare among the tying players.

OR

- All tied cards are placed in the center.
- The winner of the next round takes the center pile too.

Out of Cards:

- If a player runs out of cards, they are out of the game.

Pro Tip: Use strategy when choosing categories!

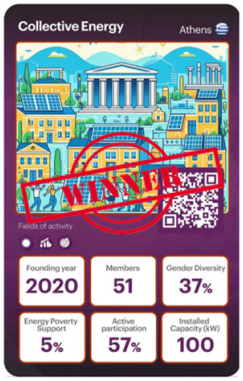
- The game ends when one player collects all the cards.

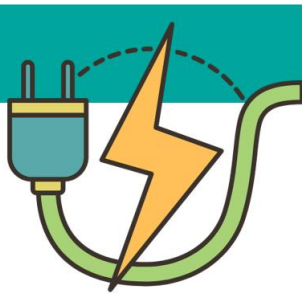
Reflection

Real-Life Applications and Takeaways:

- Decision-making.
- Assessing strengths and weaknesses in different situations.
- Strategic thinking and teamwork in action.

- Enhancing community engagement in energy markets,
- Encouraging household participation in energy communities,
- Promoting the transition to clean energy through greater use of renewables and improved energy efficiency.





Part II

The role of youth in the development of Energy Communities

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The role of youth in the development of Energy Communities

Youth should be seen as critical drivers of energy innovation.

Research has shown a **strong relationship** between **youth energy literacy** and **energy security**.

RES projects in rural communities can improve energy security, e.g., because of the geographical isolation of several rural areas.

This can lead to improved socio-economic and educational opportunities for young people, as well as the mitigation of the disproportionate and intergenerational effects of climate change on youth.

Scholars often highlight that energy transition is among the scopes that enable youth to discover their potential, build new skills, and eventually become meaningful actors in the energy transition process.

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The role of youth in the development of Energy Communities

Source: https://asianngo.org/magazine/post-magazine/article/article-detail/142/6-opportunities-to-empower-the-youth

Why are young people important for Energy Communities?

1. Youth understands renewable energy
2. Youth is a group of energy intensive consumers
3. Youth is a group more climate-aware than others
4. Youth can be agents of change by influencing members in their social networks with energy-saving behavior.

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The role of youth in the development of Energy Communities

Source: https://www.yoac-erasmus.eu/youth-movements-eu-shaping-the-future/

Youth as drivers of change in Energy Communities

- Fresh perspectives
- Sustainability mindset
- Innovation and experimentation

Source: https://trellis.net/article/why-youth-climate-movement-bright-light-during-troubled-times/

***Examples:**
Social media campaigns advocating for green policies or startups focused on clean tech innovations.

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The role of youth in the development of Energy Communities

Youth as long-term stakeholders and sustainability advocates

Source: https://givingcompass.org/article/8-lessons-for-todays-youth-led-movements-from-a-decade-of-youth-climate-organizing

Why Youth Matter for the Long Term
Youth participation ensures continuity in energy community efforts, as they have a vested interest in creating a sustainable future. Building strong foundations with youth today ensures that energy communities continue thriving into future generations.

Sustainable Living Models
Youth can advocate for and model eco-friendly living, encouraging the adoption of sustainable practices on a wider scale.

Leadership and Ownership Opportunities
Youth-led initiatives can focus on inclusive decision-making processes.
Creating leadership roles within energy communities ensures representation and accountability.

The role of youth in the development of Energy Communities

Source: https://techjournal.org/reasons-why-is-technology-important-to-teenagers

Youth as technology & innovation leaders

Adopting digital tools and platforms
Youth are often at the forefront of digital transformation, using software and apps to improve energy efficiency, storage, and distribution within communities.

Promoting smart energy systems
Involvement in smart grids, decentralized energy management, and innovative data analytics tools to optimize energy usage.

Renewable energy projects
Hands-on involvement in installing solar panels, wind turbines, or exploring new sustainable tech options.

Collaborative Projects
Collaborative innovations involving universities, startups, and energy communities for technology transfer and R&D.

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The role of youth in the development of Energy Communities

Youth as awareness and advocacy champions

Role of Awareness Campaigns
Youth play a central role in raising awareness within communities, schools, and even among policymakers about the importance of RES.

Community engagement
Organizing workshops, webinars, and community forums to educate on clean energy practices.
Initiating door-to-door campaigns and using social media platforms to spread awareness.

***Global Examples:** Greta Thunberg's global youth-led climate strikes illustrate the power of youth advocacy. Youth energy forums or networks for sharing best practices and knowledge.

Source: https://hrws.pk/product/climate-change-education-awareness-programs-to-youth/

The role of youth in the development of Energy Communities

Source:https://www.cypnow.co.uk/content/analysis/the-decline-of-open-access-youth-work-and-how-to-turn-it-around/

***Examples:**
Youth energy clubs, eco-friendly neighborhood groups, etc.

Youth as community mobilizers

Engagement with peers
Youth mobilize their peers and other community members to adopt sustainable practices and join energy communities.

Community projects
Encouraging participation in community energy initiatives such as setting up solar energy cooperatives.

Volunteerism & social impact initiatives
Participating in tree-planting, recycling, or clean-energy educational drives to create awareness and foster action.

Creating a shared vision
Building a community vision that centers around sustainable energy and inclusivity, spearheaded by youth leaders.

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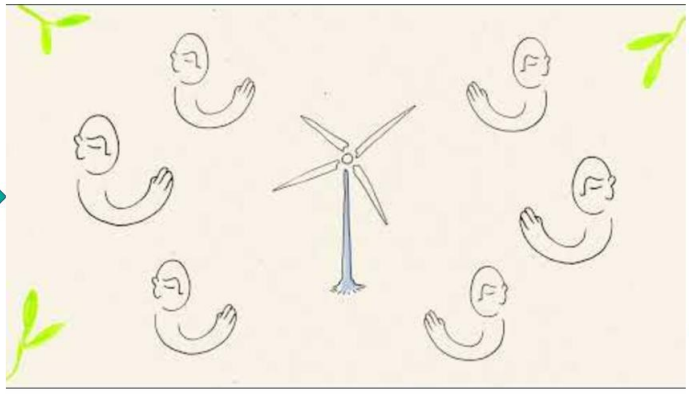
The role of youth in the development of Energy Communities

*The video provides examples of Energy Communities in Greece

Here's a description of how Energy Communities and citizenship participation can transform the energy system, by Electra Energy Cooperative.



Based on all the reasons explaining why you, young people, are extremely important for such a transformation...

Can you realize the power you have as community shapers?

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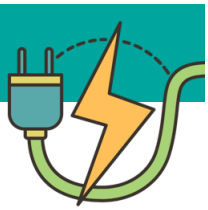
The role of youth in the development of Energy Communities



Interaction/Participatory exercise

The participants will be divided in groups of 2 and discuss between them on the question:

"What was your motivation to participate in this training today; and after what you've heard so far, how motivated are you to act as a young change-maker?" (10 mins)

After a short exchange of insights, the duos will present their key takeaways in the plenary. (10 mins)

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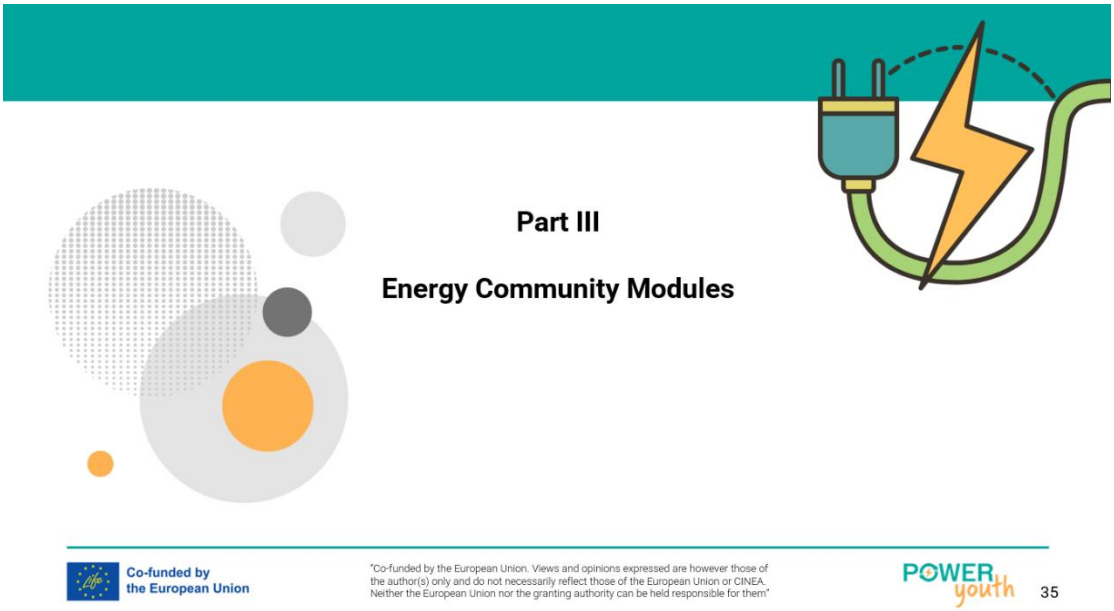
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Energy Community Modules
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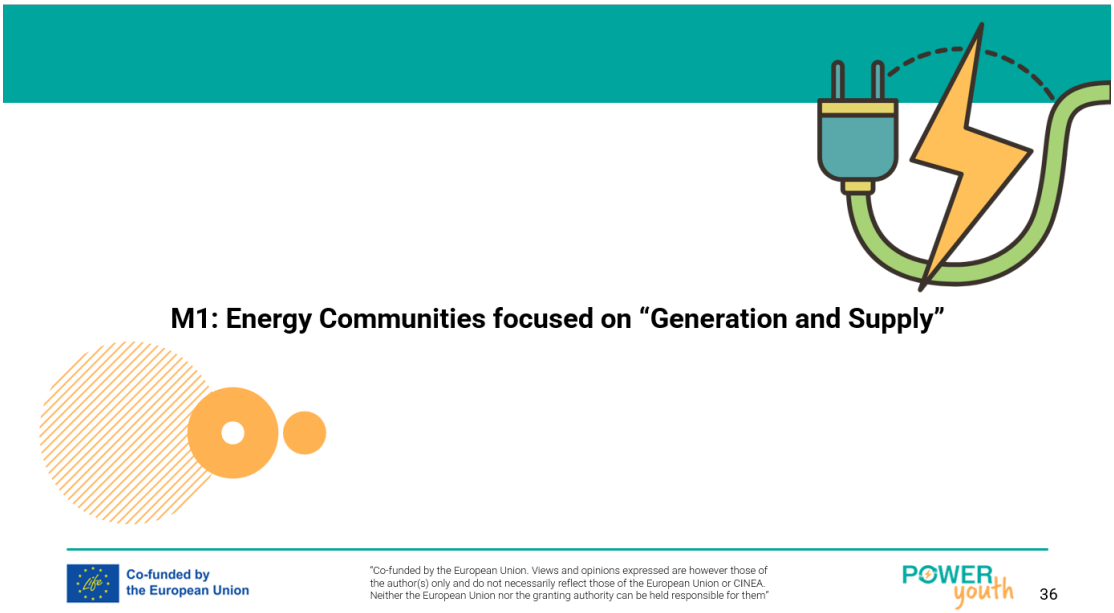
M1: Energy Communities focused on "Generation and Supply"
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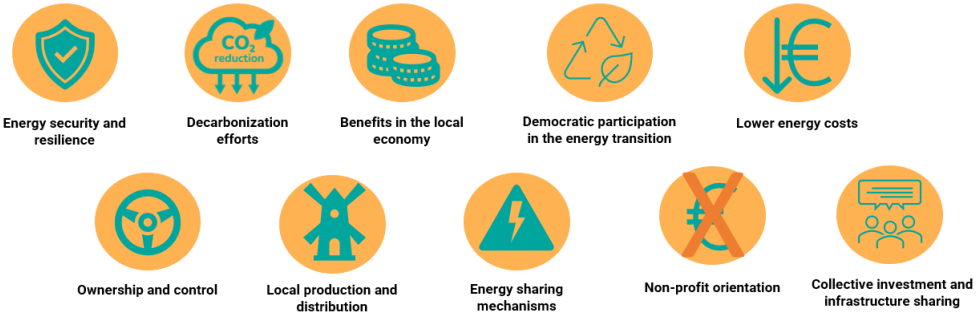
M1: Energy Communities focused on “Generation and Supply”

What are the main elements of the Energy Communities focused on Generation and Supply, and why are they important?



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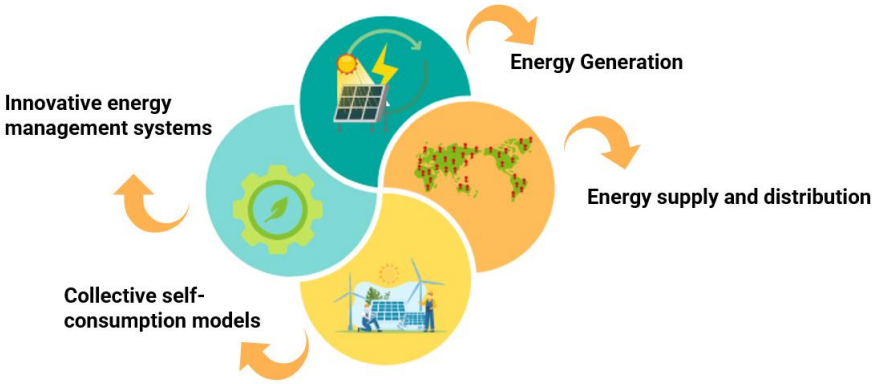
M1: Energy Communities focused on “Generation and Supply”

Activities of energy generation and supply in energy communities:



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M1: Energy Communities focused on "Generation and Supply" Case Studies

OurPower Energy Cooperative (Austria)

OurPower 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.

Source: Case Study #8: OurPower (Austria) - Interreg Baltic Sea Region

OurPower promotes various RE technologies, including small wind farms, hydropower plants, and solar panels.

Solar panels 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. Ground-mounted solar panels are also connected to the distribution system. **This decentralized approach maximizes renewable energy usage and grid resilience.**

OurPower highlights the necessity of **inclusive representation** in the energy transition and focuses on engaging women and young people.

Case StudiesM1: Energy Communities focused on "Generation and Supply"

OurPower Energy Cooperative (Austria) – Activities

OurPower's business model is based on **crowdfunding and community engagement**. Main energy consumers include households and SMEs.

The cooperative 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 for P2P matching on 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, clearing grid costs for customers.

Agreements on cost and revenue sharing exist among cooperative members, ensuring fair distribution.

Additional activities:

OurPower is **developing and testing the serve-U app. An app 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. This way, they will be able to adjust their energy consumption accordingly.

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

M1: Energy Communities focused on "Generation and Supply" Case Studies

Coopérnico (Portugal)

Coopérnico 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.

An important step in the scaling journey of Coopernico was when the community became an electricity supplier in 2019.

Source: https://www.coopernico.org/projeto/28

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.**

M1: Energy Communities focused on "Generation and Supply" Case Studies

Coopérnico (Portugal) – Activities

Coopérnico develops solar projects, allowing citizens to invest in and benefit from renewable energy.
Energy generated is sold to the grid, and revenues are 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.

Additional activities:

At the local level, groups are active in **promoting several topics such as "electric vehicles or solar production" at the community level**.

As a national player it has several advantages for its scaling, such as:
- The cooperative had the opportunity to work directly with various legislators and to lobby for institutional changes to varying degrees of success,
- The partnerships of the model depend on how they could best be built by having higher-scale legitimacy in the eyes of established institutions.

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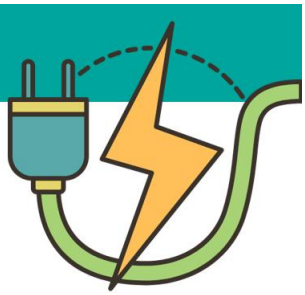

M2: Energy Communities focused on “Energy Efficiency”

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M2: Energy Communities focused on “Energy Efficiency”

Energy efficiency is a key focus area for energy communities that aims at:

1. Cost Savings
2. Environmental Benefits
3. Energy Security
4. Community Benefits

What are the main elements of energy communities focused on energy efficiency?

1. Participatory Governance
2. Energy Audits and Efficiency Measures
3. Demand Response Programs
4. Education and Awareness Campaigns

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M2: Energy Communities focused on “Energy Efficiency”

Activities and benefits of energy efficiency within energy communities

ACTIVITIES

Building Improvements and Renovations
Upgrading insulation, installing energy-efficient windows, and other retrofitting measures to improve the energy performance of the buildings involved in the energy community.

Energy Management Systems
Use of smart technologies to monitor and optimize energy consumption in real-time

Collective Energy Purchasing
Aggregated purchasing power to buy energy-efficient appliances and devices at reduced costs for the members of the community.

BENEFITS

Economic Savings
Collective savings on energy bills and access to subsidies, even more important for the vulnerable households benefited by the energy communities

Reduced GHG Emissions
Energy efficiency focused energy communities support national and international climate goals and improve the environmental impact of their members' energy consumption.

Social Cohesion
Engagement of community members in shared goals, fostering a sense of ownership and collaboration.

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M2: Energy Communities focused on “Energy Efficiency”

The concept of Net Zero Energy Communities (NZEC)

What is NZEC?

Groups of buildings or regions that collectively produce as much renewable energy as they consume over the course of a year.

What is the main goal?

Achieve net-zero energy by optimizing efficiency and generating local renewables to reduce GHG emissions and support climate goals.

Benefits

- 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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M2: Energy Communities focused on "Energy Efficiency" Case Studies

Spółdzielnia Energetyczna Eisall (Poland)

Source: https://heliosstrategia.pl/spoldzielnie-energetyczne-czym-sa-czy-warto-w-nie-inwestowac/

Spółdzielnia Energetyczna Eisall 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.
Its production capacity: 2 PV micro-installations of 10 kW each.

The cooperative aims at offering 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**.

The activities of the cooperative include: electricity generation, electricity trading, electricity distribution, electricity transmission, business and management consultancy, engineering activities and related technical consultancy.
Eisall also:

- **conducts an analysis and recommend the optimal combination of energy sources.** Making it, thus, possible to increase energy self-sufficiency and optimize costs.
- **provides the participants of the cooperative with energy security and reduction of energy purchase costs** while increasing the revenues of its producers.
- **provides innovative energy storage solutions for commercial and industrial applications** (with Neo Energy Group).

M2: Energy Communities focused on "Energy Efficiency" Case Studies

Claremorris and Western District Energy Co-Op (Ireland)

Source: https://claremorris-energy-coop.com/about-us/

Claremorris and Western District Energy Co-Operative 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.

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.**

- Two 5MWe 100% community owned solar site
- Winning RESS1 as the first of one 100% community owned sites in Ireland.
- Partnership with Mayo county council for one of the solar sites which was previously a brown field landfill site.
- Cooperation with 13 other counties in Ireland to promote renewable energy through solar.
- Has supported another 9 energy co-op through the connection to grid process.

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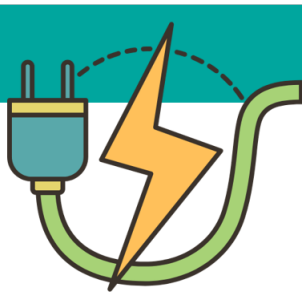

M3: Energy Communities focused on “Electro-mobility”

M3: Energy Communities focused on “Electro-mobility”

What does the term “electro-mobility” mean?

It is 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.

What are the main elements of energy communities focused on electro-mobility?

1. Collective Planning and Investment
2. Integration with RES
3. Public Awareness and Trainings
4. Shared Use Models
5. Demand Management Capabilities

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M3: Energy Communities focused on “Electro-mobility”

Activities of electromobility in energy communities

Implementing a system of **EVs** where people can **book and use** - the cars are owned by the **community** instead of individuals

Collective models of **sharing**

Establishment of several EVs **charging stations** within the facilities of the members of the energy community

Innovative energy **management systems**

Educational activities to raise awareness on electro-mobility

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M3: Energy Communities focused on “Electro-mobility”

Why is electro-mobility important for the energy communities and vice versa?

1. **EVs can increasingly use RES if deployed within energy communities**
2. To **reduce the emissions of the transport sector**
3. A cooperative can invest in a **system of EVs where people can book and use**
4. **Car sharing is a more communal experience**, allowing people to break with the individualist mentality
5. Use of a **European platform enabling energy communities across Europe to share e-cars within their communities**
6. Enhance **community inclusion in the respective decision-making processes**

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M3: Energy Communities focused on “Electro-mobility”

Why is electro-mobility important for the energy communities and vice versa?

7 **Decarbonization of the mobility sector** is driving electro-mobility and has important potential to increase the flexibility of the power system substantially.

8 To **reduce the emissions** of the transport sector

The main sources of flexibility in these cases are **the car batteries** 9

10 **PV generation potentially generating a large portion of the energy required to charge EV batteries.**

Additional load of millions of charging vehicles could **increase peak loads on the grid infrastructure** 11

12 **EVs flexibility can also reduce the need for new power generation and lower the grid infrastructure costs eventually**

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M3: Energy Communities focused on “Electro-mobility”

EVs integration and grid stability

Rising EV usage
As EVs grow in popularity, new complexities to building energy systems that integrate RES arise.

Energy demand considerations
Traditional energy demands in buildings are supplemented by the need to charge EVs, increasing overall energy demand. The integration of EVs creates new restrictions on building energy infrastructure, making careful demand management necessary.

EV charging load challenges
Accurate EV charging load prediction and management is critical. Without effective management, peak-hour electricity demand surges could compromise the stability and safety of the grid.

Optimization methods
Efficient energy management systems and strategies, including rule-based strategies and optimization algorithms, are key to managing energy systems in a holistic way.

Approach comparison
While rule-based strategies depend on expert knowledge, optimization algorithms seek optimal solutions using mathematical programming techniques. A combination of both methods can offer better overall optimization, addressing both energy scheduling needs and practical constraints.

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M3: Energy Communities focused on "Electro-mobility" Case Studies

Tilos Island Energy Community (Greece)

- Tilos, as part of the Dodecanese group of islands, lies in the mid sea between Kos and Rhodes.
- 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.
- **Tilos became a model for energy independence and has contributed to a more stable and clean local energy supply.**

Source: https://www.visitgreece.gr/el/islands/dodecanese/tilos/

Source: https://ecopress.gr/gr-eco-islands-i-technologia-tis-tilou-odigos-gia-t/

Activities:

- The project supports **community-scale wind and solar, battery energy storage, and advanced energy management and metering through Demand Side Management (DSM) strategies.**
- 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 extends its efforts to the directions of e-mobility and renewable-driven EVs charging infrastructure.**

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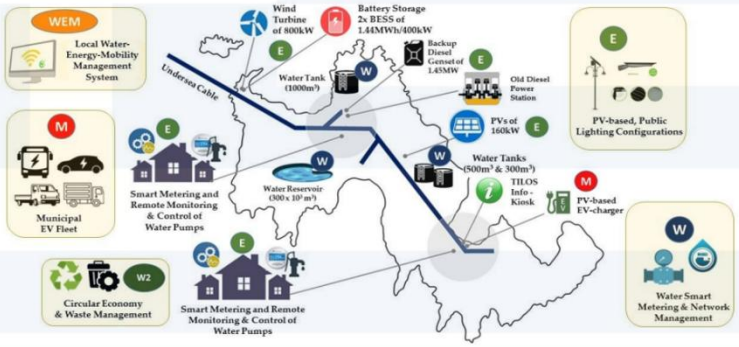
M3: Energy Communities focused on "Electro-mobility" Case Studies

Tilos' microgrid layout



Source: Katsaprakakis, D.A.; Proka, A.; Zafirakis, D.; Damasiotis, M.; Kotsampopoulos, P.; Hatziargyriou, N.; Dakanali, E.; Arnaoutakis, G.; Xevgenos, D. Greek Islands' Energy Transition: From Lighthouse Projects to the Emergence of Energy Communities. Energies 2022, 15, 5996. https://doi.org/10.3390/en15165996

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M3: Energy Communities focused on "Electro-mobility" Case Studies

Tilos Island Energy Community (Greece) - Role and importance of Electric Vehicles (EVs) in the Tilos Energy Community

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.

- EVs in the Energy System
- Sustainable Mobility: EVs play a central role in promoting zero-emission transportation on the island.
- Grid Balancing: 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.
- Support for RES integration: Tilos relies on solar and wind power and EVs help mitigate the intermittency of renewable sources.

Integration into the energy system

- Smart charging strategies: 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.
- Vehicle-to-Grid (V2G) capabilities: **In some cases, EVs act as dynamic energy storage units, contributing energy back to the grid during peak demand periods, further enhancing grid flexibility.**

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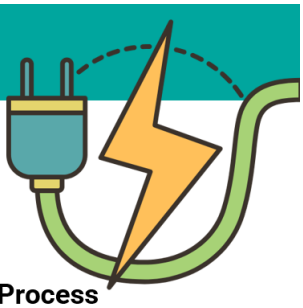

Part IV

Energy Communities Monitoring and Evaluation Process

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Monitoring and Evaluation of an Energy Community

Monitoring and Evaluation (M&E) in Energy Communities – Why is it important and how it can happen?

The key factors on why monitoring and evaluation is important for energy communities rely on the following concepts:

- ✓ **Performance Assessment**
  M&E helps measure progress towards achieving the energy community's goals, such as emission reductions, cost savings, or energy efficiency improvements.
- ✓ **Accountability**
  M&E Provides transparency and builds trust among community members and stakeholders by demonstrating the community's achievements and areas for improvement.
- ✓ **Continuous Improvement**
  M&E identifies challenges, successes, and lessons learned, facilitating the improvement of energy initiatives and optimizing resource use.
- ✓ **Regulatory Compliance**
  M&E helps ensure the community's compliance with national and EU regulations and supports reporting obligations to regulatory bodies.

Key Focus Areas for M&E

- ✓ Environmental impact
- ✓ Economic outcomes
- ✓ Social benefits

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Monitoring and Evaluation of an Energy Community

Monitoring methods

Data collection and analysis

- Smart Meters: To track energy consumption and production in real-time, providing critical data for performance analysis.
- Carbon Footprint Measurement: To calculate the community's carbon emissions reduction compared to baseline data.
- Surveys and Community Feedback: Regular surveys to monitor members' satisfaction, engagement levels, and perceived benefits.

Environmental metrics

- Energy Efficiency Metrics: To assess the reduction in energy consumption due to implemented measures.

Economic metrics

- Cost-Benefit Analysis (CBA): To track the financial performance of energy projects and evaluate profitability.
- Payback Periods: To measure how long it takes for energy investments to become profitable.

Social impact metrics

- Community Participation Rates: To monitor the levels of engagement in meetings, initiatives, and programs.
- Equity and Inclusion Assessments: To evaluate whether all community segments benefit from energy projects.

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Monitoring and Evaluation of an Energy Community

Evaluation methods

Baseline and benchmarking analysis
- Baseline Setting: To establish initial data points for comparison over time.
- Benchmarking: To compare energy community performance with similar communities or regulatory targets.

Key Performance Indicators (KPIs)
- Environmental KPIs: To evaluate the reduction in carbon emissions, the increase on the RES shares, and the waste reduction.
- Economic KPIs: To evaluate the revenue generated, the operational savings, and the energy cost reductions for members.
- Social KPIs: To evaluate the membership growth, to collect satisfaction surveys, and to assess the benefits distribution across community members.

Qualitative evaluation methods
- Focus Groups and Interviews: To collect insights on member experiences, challenges faced, and recommendations for improvement.

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Monitoring and Evaluation of an Energy Community

Recommendations on more effective M&E

Clear objectives and metrics
- Important to have specific, measurable, achievable, relevant, and time-bound (SMART) goals.
- Need to develop customized KPIs aligned with these objectives, covering environmental, economic, and social outcomes.

Utilize technology and digital tools
- Smart Grids and IoT Devices: Necessary to use advanced digital tools for automated and real-time data collection.
- Data Analytics Platforms: Important to analyze collected data to generate insights, identify trends, and detect potential issues early.

Ensure community participation
- Significant to involve all community stakeholders in defining evaluation criteria and processes.
- Crucial to foster transparency by regularly sharing monitoring results with community members and exchanging insights and feedback.

Engage with experts and policymakers
- Useful to work with energy experts to design effective M&E frameworks.
- Important to collaborate with policymakers to ensure that the community remains aligned with evolving regulations and goals.

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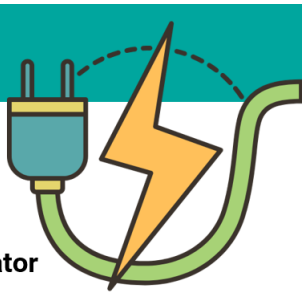

Part V
How to become an Energy Community Initiator and/or Young Energy Ambassador

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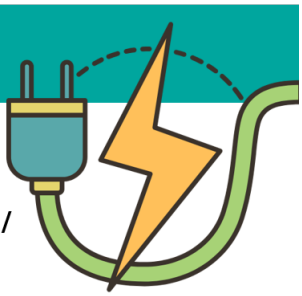

Becoming an Energy Community Initiator / Young Energy Ambassador

Activity II: Preparing Your Energy Community – Do it first

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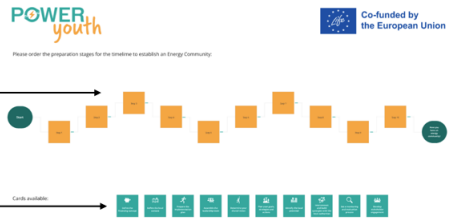
Preparing Your Energy Community – Do it first. How to play:

Objective
Be the first team to correctly assemble the timeline for establishing an Energy Community (EC).

Setup
- Participants are divided into **two teams** (4 players per team).
- Each team receives:
  - **An empty timeline** with **10 steps** to be filled in.
  - **A set of 10 shuffled step cards**, each describing a key step in forming an EC.



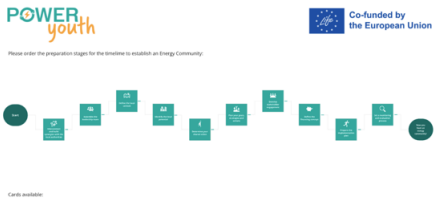
Instructions
1. Each team has **5 minutes** to arrange the step cards in the correct order on the timeline.
2. Teams must collaborate and think critically about the **logical sequence** of steps.
   Example: (1) **"Assemble the leadership team."**
3. The team that **correctly completes the timeline in the shortest time** wins.

Preparing Your Energy Community – Do it first. How to play:

Winning Criteria
- The first team to complete the timeline correctly **OR** the team with the most correct steps when time runs out is the winner.

  💡 **Tip:** Think strategically—some steps naturally come before others!

Wrap-Up (10 minutes)
- Mentors and mentees discuss the reasoning behind the correct timeline.
- Teams reflect on challenges they faced and key takeaways.



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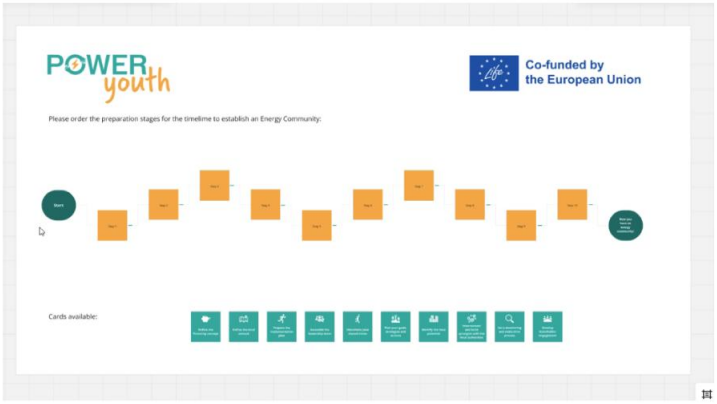
Preparing Your Energy Community – Do it first. How to play:



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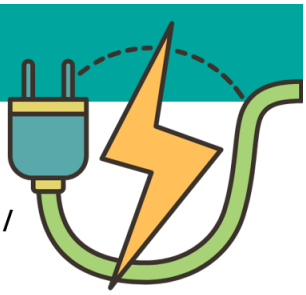

Becoming an Energy Community Initiator / Young Energy Ambassador

Activity III: Building Your Energy Community

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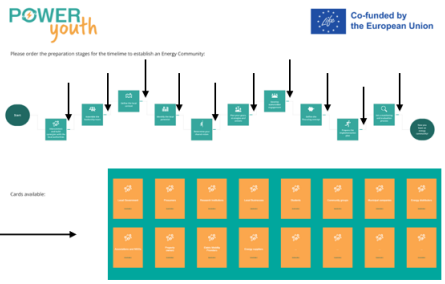
Building Your Energy Community. How to play:

Objective
Use the timeline from Activity ii to start designing your own Energy Community.

Setup
- Participants form **pairs (redistributed from the last exercise).**
- Each pair has to go deeper and discover:
  - A "canvas" divided **into 10 steps** (some steps include sub-steps).
  - **Color-coded cards** for each step/sub-step, including pre-written options and blank cards for custom ideas.



Building Your Energy Community. How to play:

Instructions
1. Follow the timeline from Activity 2 to **build your Energy Community plan** step by step.
2. For each step, select the **most relevant** cards and place them on the canvas.
   Example for **Step 1: Identify Stakeholders & Partnerships**
   Who can help you deliver value to beneficiaries?
   Which key stakeholders are involved?
   Pick the most suitable cards OR create your own using blank cards.
3. You have 3**0 minutes** to complete your canvas.

Wrap-Up: Present & Discuss (15 minutes)
- Each pair presents their Energy Community concept to the group.
- Mentors and fellow mentees provide feedback and discuss different approaches.

Building Your Energy Community. How to play:

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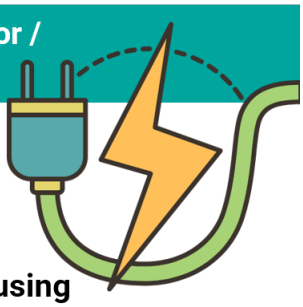

Work further on the real initiation case using the POWERYOUTH toolkit (in pairs-1,5 hour)

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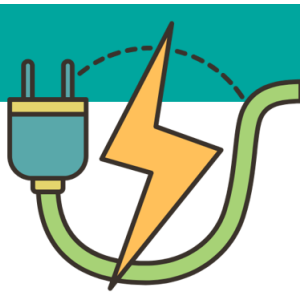
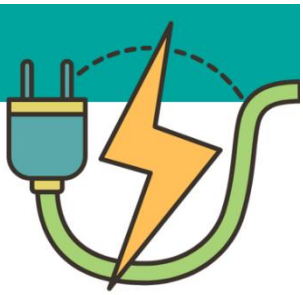
Participants' Feedback



Complete the evaluation questionnaire



Q & A

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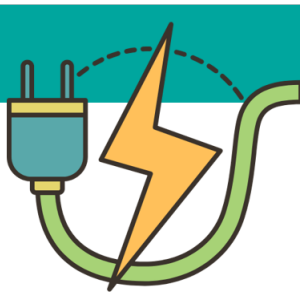
Next Steps



After completing this training, do not forget to:

- Progress your initiative and keep us in the loop
- Spread the word to your network
- Bring more young people on board
- Support the initiation of new endeavors

AND ALWAYS REMEMBER…!

"You are never too small to make a difference."
- Greta Thunberg

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THANK YOU!

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Annex II

POWERYOUTH follow-up material handbook

The follow-up handbook aims to provide enriched information to the participants of the capacity building programme, regarding the thematic areas of the training, as they have been unfolded in the previous chapters of this deliverable.

The handbook stands as an independent document, divided in chapters according to the training material, while it also includes resources and references for the information provided, so that the participants can delve deeper into these topics.

You can find the whole POWERYOUTH follow-up material handbook **here**.

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Annex III

A. Benchmarking questionnaire / survey

I. Benchmarking Questionnaire (in Mentimeter)

1. Familiarity with Energy Communities

Question: How familiar are you with the concept of energy communities?
Answer Format: Scale of 1–5 (1 = Not at all familiar, 5 = Very familiar).

2. Purpose of Energy Communities

Question: What do you think is the primary purpose of an energy community?
Answer Format: Multiple choice (select one):

a) Reducing energy costs.
b) Promoting renewable energy.
c) Increasing local energy independence.
d) Democratization of energy provisioning.
e) All of the above.

3. Types of Activities in Energy Communities

Question: Which activities do you associate with energy communities?
Answer Format: Multiple choice (select all that apply):

a) Renewable energy generation (e.g., solar panels).
b) Energy efficiency projects (e.g., retrofitting buildings).
c) Electrification of transport (e.g., EV charging infrastructure).
d) Local energy storage solutions.
e) All of the above.

4. Youth's Role in Energy Transition

Question: In your opinion, how significant is the role of youth in driving the energy transition?
Answer Format: Scale of 1–5 (1 = Not significant, 5 = Extremely significant).

5. Barriers to Youth Participation

Question: What do you think are the biggest barriers for youth to participate in energy communities?
Answer Format: Open-ended (optional word cloud for interactive platforms like Mentimeter).

6. Benefits from Youth Participation

Question: What do you think are the biggest benefits for youth to participate in energy communities?
Answer Format: Open-ended (optional word cloud for interactive platforms like Mentimeter).

7. Benefits of Electromobility in Energy Communities

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Question: How beneficial do you think electromobility (e.g., EVs, shared e-mobility) is for energy communities?
Answer Format: Scale of 1–5 (1 = Not beneficial, 5 = Extremely beneficial).

8. Types of Energy Efficiency Initiatives

Question: Which of the following, according to your opinion, best depicts an energy efficiency initiative?
Answer Format: Multiple choice (select one):

a) Installing solar panels.
b) Retrofitting homes with better insulation.
c) Purchasing more electricity from the grid.
d) Using diesel generators during peak hours

9. Key steps to follow for an Energy Community

Question: What do you think are the key steps to follow when starting an energy community?
Answer Format: Put in order (drag-and-drop):

- Identify a group of interested community members.
- Define common goals and objectives for the community.
- Assess the available resources (e.g., financial, technical).
- Register the community following local legal frameworks.
- Develop and implement an action plan.
- Monitor and evaluate the community's performance.

10. Confidence in Starting an Energy Community

Question: How confident do you feel about starting or participating in an energy community?
Answer Format: Scale of 1–5 (1 = Not confident at all, 5 = Very confident).

B. Evaluation questionnaire

II. Evaluation Questionnaire (in Google Forms)

Introduction - A few words on the project:

POWERYOUTH is an EU funded initiative that empowers young people to actively participate in energy transition through involvement in energy communities. It fosters dialogue between youth and local stakeholders and promotes youth leadership using participatory tools. Piloted in five EU countries, the project includes the capacity-building program you attended aiming to spread the POWERYOUTH approach across Europe.

At this point of the capacity building programme, you are kindly asked to fill out this questionnaire, in order to provide your valuable feedback.

This questionnaire aims to collect your thoughts and insights on how to optimize the way the training is designed and delivered, as well as in order to facilitate the further development of the project and its Europe-wide replication potential.

Thus, your feedback is crucial at this stage, to help us improve the POWERYOUTH methodology and achieve the project's replication goals.

Please note that the questionnaire is anonymous and can be answered within 15 minutes.

Thank you.

A. Study visit

1. How interesting did you find the study visit?
   Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

2. How useful was the study visit to improve your understanding on Energy Communities?
   Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

3. How would you rate the coordination of the study visit?
   Answer Format: Scale of 1-5 (1 = Poor, 5 = Excellent)

B. Content of the Training

4. How would you rate the overall quality of the content delivered during the training?
   Answer Format: Scale of 1-5 (1 = Poor, 5 = Excellent)

5. Did the training provide you with sufficient knowledge about the concept of energy communities?
   Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

6. Which topics were most helpful or relevant to you?
   Answer Format: Multiple Choice (Select all that apply)
   a) Introduction to Energy Communities
   b) The youth element in energy communities
   c) Energy Generation & Supply
   d) Energy Efficiency
   e) Electromobility
   f) Monitoring & Evaluation

7. Did the training clarify the role of youth in establishing and driving energy communities?
   Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

8. Were the different types of energy communities (generation/supply, efficiency, electromobility) explained in sufficient depth?

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Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

9. What additional topics or areas would you have liked to see covered in the training?
   Answer Format: Open-ended

C. Process of the Training

10. How would you rate the structure/flow of the training?
    Answer Format: Scale of 1-5 (1 = Poor, 5 = Excellent)

11. How would you rate the balance between presentations and interactive activities?
    Answer Format: Scale of 1-5 (1 = Too Much Presentation, 5 = Perfect Balance)

12. How engaging did you find the interactive parts of the training (e.g., card game, simulation game)?
    Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

13. Did the card game help you understand key concepts related to energy communities?
    Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

14. Was the simulation game effective in helping you apply the knowledge gained during the training?
    Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

15. Did the trainers create an environment where you felt comfortable to participate and share your ideas?
    Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

16. Did the training feel inclusive and cater to participants with different levels of prior knowledge?
    Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

17. What aspects of the interactive sessions could be improved for future trainings?
    Answer Format: Open-ended

D. Logistics and Organization

18. How would you rate the overall organization of the training (timing, materials, venue/platform, etc.)?
    Answer Format: Scale of 1-5 (1 = Poor, 5 = Excellent)

19. Were the training materials (e.g., slides, handouts) clear and helpful?
    Answer Format: Yes/No

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20. Was the timing and duration of the training appropriate for covering all topics?
    Answer Format: Yes/No

21. Do you think the training format (combining presentations, games, and discussions) was effective?
    Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

22. Would you recommend this training to other young people interested in energy communities?
    Answer Format: Yes/No

23. Do you have any additional comments or suggestions for improving future training sessions?
    Answer Format: Open-ended

E. Scope of the Training: Questions to Showcase Participant Progress

24. How confident do you feel in explaining the concept of energy communities to others after the training?
    Answer Format: Scale of 1-5 (1 = Not Confident at All, 5 = Very Confident)

25. How would you rate your understanding of the role of youth in the energy transition compared to before the training?
    Answer Format: Scale of 1-5 (1 = No Improvement, 5 = Significant Improvement)

26. Do you feel equipped to identify the key steps needed to establish an energy community after this training?
    Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

27. How well do you now understand the different types of activities that can be undertaken by an energy community (e.g., energy generation, energy efficiency, electromobility)?
    Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

28. How likely are you to take the initiative or actively participate in forming an energy community (Youth Energy Community Initiator)?
    Answer Format: Scale of 1-5 (1 = Not Likely at All, 5 = Very Likely)

29. How likely are you to take the initiative or actively participate in supporting an energy community (Youth Energy Community Ambassador)?
    Answer Format: Scale of 1-5 (1 = Not Likely at All, 5 = Very Likely)

F. Replication of the POWERYOUTH approach

30. How supportive are key stakeholders (municipalities, utilities, NGOs) toward youth-led energy initiatives in your region?
    Answer Format: Scale of 1-5 (1 = Not at All, 5 = Completely)

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POWER youth

31. Which target groups/stakeholders do you think are important to focus on for the replication of POWERYOUTH in your region?

Answer Format: Multiple Choice (Select all that apply)

a) Local government (municipalities, regional councils)

b) Utility companies (energy providers, grid operators)

c) Youth organizations (student clubs, youth councils)

d) Schools/universities (teachers, administrators, student bodies)

e) NGOs and community-based organizations

f) Private sector (businesses, SMEs, corporate CSR programs)

g) Other (please specify)

32. What funding sources (grants, private investment, crowdfunding, etc.) are most accessible or realistic for new energy initiatives in your community?
Answer Format: Multiple choice selection (Select all that apply)
    a) Government Grants (Public funding for clean energy and youth-led projects)
    b) Private Investments (Support from investors or businesses interested in green energy)
    c) Crowdfunding (Raising money from the community via platforms like Kickstarter, GoFundMe, Indiegogo platforms)
    d) Corporate Sponsorships & Partnerships (Create partnerships with with companies that support sustainability)
    e) Bank Loans (Special loans for renewable energy projects)
    f) Nonprofit & Foundation Grants (Funding from environmental and community organizations)
    g) Other (please specify): _____

33. What local conditions (e.g., *cultural norms, economic challenges, access to technology, government policies, and community support*) might require you to adapt the POWERYOUTH methodology to ensure success in your region?
Answer Format: Multiple choice selection (Select all that apply)
    a) Government Policies – Laws or policies that affect energy projects
    b) Economic Conditions – Funding availability and financial barriers
    c) Technology & Infrastructure – Access to renewable energy tools and resources
    d) Community Support – Public interest and willingness to participate
    e) Education & Awareness – Access to knowledge about clean energy
    f) Cultural Beliefs – Local attitudes toward sustainability and innovation
    g) Funding & Partnerships – Availability of grants, investors, and sponsorships
    h) Other (please specify): _____

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34. In which areas do you feel additional training or support is needed for successful replication?
    Answer Format: Multiple Choice (Select all that apply)
    a) Technical knowledge (solar, wind, energy storage, etc.)
    b) Financial or business planning
    c) Community engagement and outreach
    d) Policy/regulatory navigation
    e) Project management and leadership
    g) Other (please specify)

35. Which strategies or approaches do you consider most effective for actively involving local youth and community members in the replication process for POWERYOUTH?
    Answer Format: Multiple Choice (Select all that apply)

    a) Hosting interactive workshops

    b) Establishing a youth-led advisory board

    c) Using social media and online campaigns

    d) Partnering with local schools or universities

    e) Organizing community events and open forums

    f) Other (please specify)

36. Are there existing local energy initiatives or networks you could partner with to accelerate or amplify your replication efforts?
    Answer Format: Open-ended

37. How likely is it to begin implementing a new energy initiative within the next 6–12 months in your community?
    Answer Format: Scale of 1-5 (1 = Not Likely at All, 5 = Highly Likely)

    37.A. **[link to question 31: if the person answers most likely, highly likely] What are the first 2–3 actions you plan to take to initiate additional collective energy projects, based on what you've learned from POWERYOUTH?
    Answer Format: Open-ended

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