INTERACT

Integration of Innovative Technologies of Positive Energy Districts into a Holistic Architecture

D.6.1. Roadmap for the implementation of the designed INTERACT Energy Community in general and for the specific local perspectives

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Executive Summary

INTERACT Vision: viable, fully integrated Energy Communities

The newly formed energy communities are rising within Europe, but legislation is still general, market structures do not consider them, and they lack technical coordination with the power grid. To solve this, the vision of the INTERACT project is a viable, fully integrated Energy Community (FI-REC) integrated into technological energy systems such as electricity, heating, cooling, and gas, and into the market structure to fully use their potential to enable the proactive participation of customers, and support investments into renewable energy sources and their transmission systems.

FI-RECs build on the EU definition of Renewable Energy Communities but establish and operate local market(s) in harmony with the power grids and other existing markets, enabling the active energy trading of members regardless of size, with a primary purpose of providing environmental, economic, or social community benefits.

The analysis of today's electricity market structure shows that Energy Communities and other smaller entities are currently unable to fully participate in the market. Therefore, we propose a different market structure, in line with the physical flows of electricity, that supports automated and fair participation of all actors, regardless of their size, in the market at different levels, without compromising the high-reliability requirements of the power grid.

The FI-REC facilitates the local retail market, having a trading volume range of some hundred kWh per day. It provides an electricity-trading platform to sell and buy electricity, flexibilities, and other services in its area. All community members are enabled to adjust their consumption according to market signals. In return, they benefit from lower electricity prices and other incentives. FI-RECs are integrated to the power grid in a way that increases grid stability, uses flexibility potentials, supports emergency recovery, and increases robustness versus congestion and blackouts.

FI- RECs amplify the social, environmental, and economic benefits created by Energy Communities:

i. it contributes to further democratization by establishing the local market (social benefits),
ii. appropriate reactive power control strategy suggested by the LINK architecture increases grid capacity thus enabling the further development of renewable resources and reduction of CO_2-emissions (environmental benefits),
iii. the self-consumption of locally generated renewable energy ensures savings in energy costs for the participants with an additional source of income by provision of flexibility services to the grid (economic benefits).

To realize these goals, the project INTERACT suggests a three-stage strategy to reach full-scale implementation of FI-RECs (from 1. Preparation and pilot phase, through 2. National strategy to 3. Fast promotion) with 10 Key Implementation Steps to realize FI-RECs (see Chapter 3).

This roadmap also offers an analysis and step-by step action plan to implement FI-RECs for (1) a built-up area, exemplified with the specific case of a rural community in Lower Austria, Municipality Großschönau (Chapter 5), and (2) the analysis and action plan for a greenfield project, exemplified with the case of a development area in Fyllinge, Sweden (Chapter 6).

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1 Introduction

The EU promotes low-carbon society, distributed energy resources and management as part of its climate change policy and Net-Zero emission strategy. Positive Energy Districts and Neighbourhoods should contribute to their realisation by encouraging under others the energy communities, ultimately leading to a climate-neutral economy.

The European Union has defined two types of energy communities: the Renewable Energy Community (REC) according to Renewable Energy Directive (EU) 2018/2001 and the Citizen Energy Community (CEC) according to Internal Electricity Market Directive (EU) 2019/944. Their definitions contain many common themes: The focus is on people, not technology, and overall societal benefit, not shareholder profit. Both are based on voluntary participation and aim to promote effective control by citizens, local authorities, and small businesses not primarily active in the energy sector. A European scheme [1] was set up in 2017 to take full advantage of the flexibility of all resources by establishing international markets for frequency balancing ancillary services. Since 2019, European Commission has given the Directive to organise a competitive electricity market across country borders, contributing to the security of supply and sustainability [2]. At the same time, it underlines the need to adapt the Union Market Rules to the new market reality, putting forward the Commission's vision for a retail market that better serves energy consumers and linking wholesale and retail markets.

The regulatory framework for Energy Communities defined on the EU level leaves many details of the transposition process to the national level (e.g., governance and membership-related questions, the definition of physical boundaries of RECs, or questions regarding ownership). It does not ensure full integration into the electricity market or power grid, so newly formed agile Energy Communities face several significant challenges [3].

Energy communities based on technological components (e.g., energy generation, storage, and management) should coordinate with the power grid. They must be reliable and economically viable and cannot be established or function without an appropriate governance structure, local public engagement, and societal support.

The INTERACT project proposes Fully Integrated Renewable Energy Communities (FI-REC) coordinated with the power grid. They provide consumers with reliable, environmentally friendly electricity at the lowest possible cost, based on a new market structure in line with the European Commission directives, promoting active consumer participation, supporting grid stability, and ensuring data protection and privacy.

The roadmap for the development and implementation of FI-RECs is described in the following. It is illustrated with the specific roadmaps in the analysed brown and green field areas in Austria and Sweden.

2 INTERACT Vision: Viable Fully Integrated Energy Communities

The newly formed energy communities are still in their infancy; legislation is very general, market structures do not encourage them, and there is a lack of technical solutions and coordination with the power grid.

The vision of the INTERACT project are viable, Fully Integrated Energy Communities (FI-REC) into the technological energy systems such as electricity, heating and cooling, and gas systems employing sector coupling, and into the market structure to fully use their potential to enable the proactive participation of customers, and support investments.

A thorough analysis from unchangeable physical laws to man-made market rules, regulations, legislation, and organization provides the foundation for the FI-REC, Figure 1.

Figure 1 - From physical laws to man-made market rules, regulation, legislation, and organization.

2.1 What is a FI-REC?

A FI-REC is a reliable actor in the energy landscape. It is coordinated and harmonised with the power grid and market to supply customers with reliable, environmentally friendly electricity at the lowest possible cost, Figure 2.

INTERACT extended the EU definition of Renewable Energy Community to make it more straightforward and practicable for implementation as follows [D4.1, §3.1]:

FI-REC means a legal entity:

(a) Which is based on open and voluntary participation. It is autonomous and effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects, owned and developed by that legal entity.

(b) Where the shareholders or members are natural persons, SMEs, or local authorities, including municipalities.

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

(d) Which establishes and operates local markets in harmony with the grids and other markets to enable the active energy trading of the shareholders or members.

Its fully integrated operation is reached when the FI-REC is connected and embedded into the power grid and the electricity market structure. INTERACT proposes a new energy market structure, enabling this connection in a standardised and seamless manner based on the holistic *LINK* architecture [D5.2., §3.7].

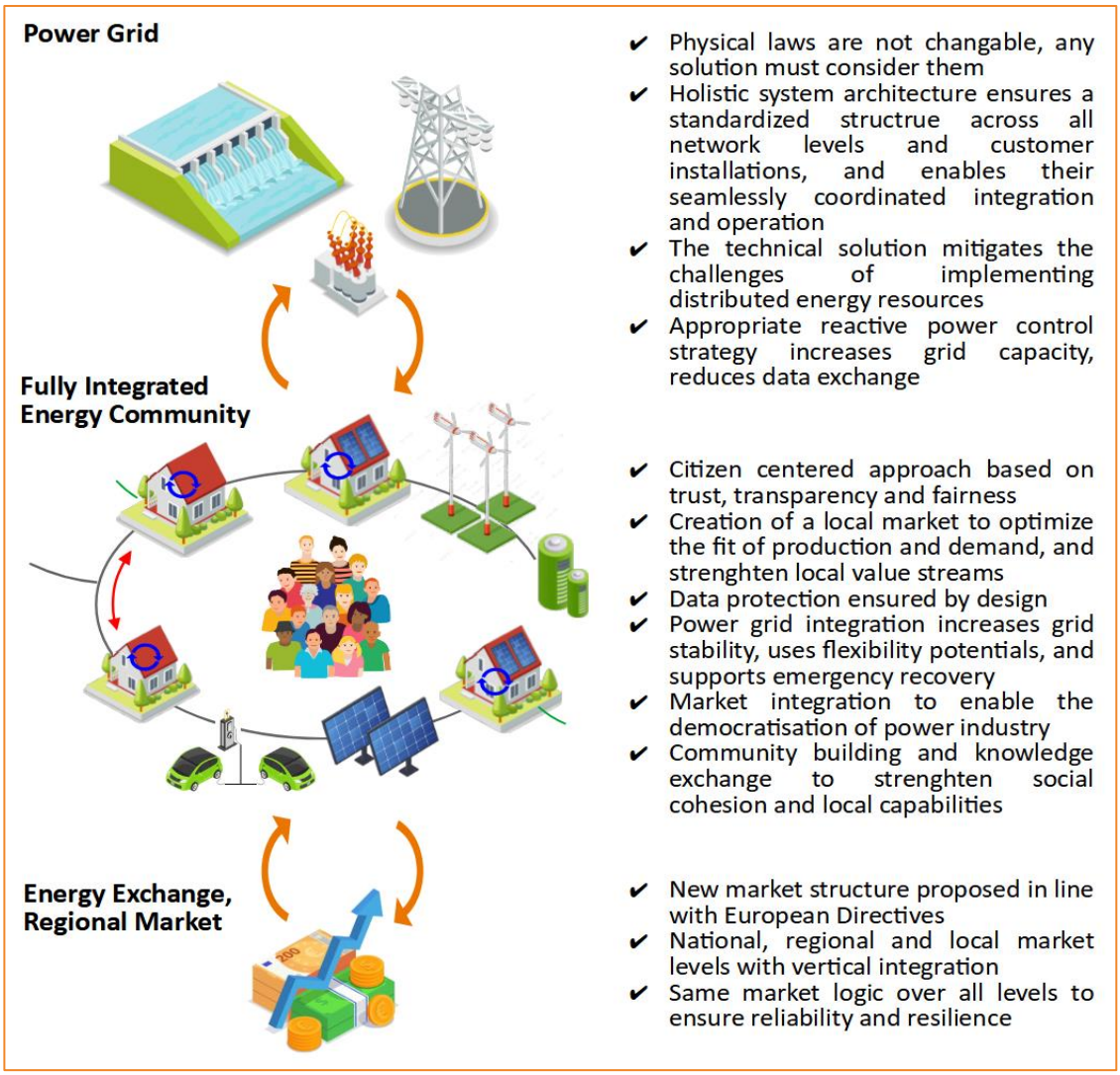

Figure 2 – Illustration of the Fully Integrated Renewable Energy Communities.

2.2 Why FI-RECs are needed

FI-REC are needed to allow all players, regardless of size, to participate fairly in the market without compromising the high-reliability requirements of the power grid.

The analysis of the current **electricity market** structure shows that Energy Communities and other smaller entities are, at the moment, unable to participate in the market. The latter was structured when the electricity system was more unidirectional, and smaller entities only consumed electricity. With an increasing number of DERs, and local entities also producing electricity and capable of providing further supporting services to the grid, this market structure no longer seems appropriate.

Therefore, we propose a different market structure, in line with the physical flows of electricity, that supports automated and fair participation of all actors, regardless of their size, in the market at different levels. In line with the fractal structure of the power grid itself, also the market structure is structured in a fractal way: a national/international market, a regional market, and a local market, where each lower level participates in the level above [D4.3., §5].

"The INTERACT Energy Community facilitates the local retail market, having a trading volume range of some hundred kWh per day. It provides an electricity-trading platform to sell and buy electricity, flexibilities, and other services in its area. All community members benefit from directly participating in the local retail market by adjusting their consumption according to market signals. In return, they benefit from lower electricity prices or other incentives." [D4.3., §4.2.1]

The holistic *LINK* architecture allows the FI-REC to be **technically coordinated with the power grids**, thus ensuring high-reliability requirements and resilience. The chain of secondary controls on the whole grid and the Customer Plant Management Units at the customer level are the instruments for the coordinated technical operation.

2.3 Benefits triggered by FI-RECs

FI- RECs amplify the social, environmental, and economic benefits created by an EC:

In the social realm, thanks to the technical solution based on the *LINK* architecture, FI-RECs strengthen data protection and lower the need for data exchange among members of the community and the grid. By establishing the local market, FIR-REC enables all consumers and producers regardless of size to democratically decide on the price mechanism applied in each period, assuring their active participation in the local market. The established ICT structure may be used to set up community services which nurture social cohesion and community building. The organizational structure shall install transparent and fair rules for all members to allow for viable operations.

In the environmental realm, the appropriate reactive power control strategy suggested by the holistic architecture increases grid capacity. This enables maximal development of renewable resources and reduction of CO_2-emissions. Price mechanisms used in the local market shall trigger further investments in DERs, increasing environmental benefits.

In the economic realm, the design of the local market together with specific local conditions ensures the economic viability of the FI-REC [D5.3]. Optimizing the self-consumption of locally generated renewable energy ensures savings in energy costs on a citizen and community level. An additional source of income is the provision of flexibility services to the grid. On a regional level the FI-REC allows for more efficient use of the grid and therefore a more cost-efficient way to develop the power supply for the current energy transition.

3 Key Implementation Steps to realize FI-RECs:

Actions should be taken at different levels in parallel for the promotion and large-scale implementation of FI-REC, Table 1. In the first stage, preparation and pilot phase at the EU level, standards should be defined and refined for technological integration and market structure specification and adoption through R&Ds. The standards need to be transposed within national strategies in a second stage and afterwards promoted on different levels for the different stakeholders to reach a fast rollout within a final third stage.

Table 1 – Three-stage strategy to reach full-scale implementation of FI-RECs

	Stage 1: Preparation and pilot phase	**Stage 2: National strategy**	**Stage 3: Fast promotion**
	(6 years)	(1 - 2 year)	(5 years)
Regulation	Adapt the current market structure to better mirror the physical flows of electricity and incentivize its implementation	Specify instructions about the roles of and within fully integrated energy community and their structures	Establish local schemes and standards for the support and facilitation of energy community deployment
	Detail standards for creation and operation of local energy markets and detail the market rules for integration into the adapted market structures	Guarantee legal framework and resources needed for the deployment of fully integrated Energy Communities	Establish local electricity markets to enable energy communities to participate in the market
Technology	Detail the standards for chain controls in power systems and customer plants in accordance with the *LINK* holistic architecture (communication and control) including replicability, scalability, and data protection by design		Continues improvement: Regular revision of technical Norms, further R&D, etc.
	Develop standards for technology providers and manufacturer to incorporate features for automated operation with controlling units in customer plants		Facilitate the upgrade to automatically integrated technology on customer level
Behaviour & Stakeholders	Establish and motivate pilot implementations as best practices, through supporting structures (policy, umbrella organizations etc.).	Enable and engage stakeholder participation through clear participation models with defined responsibilities, supported through local, trusted intermediaries, accompanied by participatory processes and capacity building at all levels	
Research & Development	Launch fully integrated Energy Community pilots in suitable locations for proof of concepts.	Disseminate information about results and verified benefits to support large scale roll-out	

3.1 Technology: Harmonize customer plants and power system

The holistic *LINK* architecture [4] offers a standardized solution for all voltage levels (high-, medium- and low voltage) and costumer plants. It enables secure, reliable, sustainable, and efficient operation in normal and emergency cases for end users and power grid. It facilitates integration of decentralized generation by better utilization of existing infrastructures.

Action point: Detail the standards for chain controls in power systems and Customer Plant in accordance with the *LINK* holistic architecture. Development based on a common architecture is critical to achieving convergent outcomes.

3.2 Regulation: Fractal market solution

The proposed adapted market structure better mirrors the physical flows of electricity and incentivizes its development. It is quite simple as it derives from the fractal structure of Smart Grids. The structure focuses on operation efficiency based on market areas and their coordination. It stimulates capital investment by providing appropriate incentives.

Action point: Split markets at the national/international, regional, and local levels to reduces the current complexity due to the variety and economics of the resources, their uncertainties, and the power system constraints.

Action point: Develop intelligent pricing mechanisms to prompt efficient capital investments. A capacity market could also coordinate investments.

3.3 Regulation: Detail standards and rules for the new market structures

The establishment of a local energy market and its integration requires specific standards and rules to be identified at the beginning. Along with energy trades and end-user-flexibility, the economic sustainability of local energy markets is one of the key requirements to be considered [5]. Economic evaluation of business cases showed that the economic viability of FI-RECs was dependent on the market conditions with regards to price levels and stability. Potential grid fee reductions impact locally used infrastructures positively [D5.3].

Action point: Detail standards for creation and operation of local energy markets.

Action point: Detail rules for integration into the adapted market structures (market rules).

Some identified standards for creation of a local energy markets and its integration into the adapted market structure are as listed as follows:

- Contractual agreements – localized contractual agreements shall be established following principles of procedural fairness and distributional fairness, covering consumer protection and tax laws.
- Role definitions – the roles of all the internal and external actors within the local market of the FI-REC must be well defined based on the relationship between these actors.
- Definition of pricing mechanisms – The operation of FI-REC local market is designed with a fractal structure enabling all consumers and producers regardless of size to democratically

decide on the price mechanism applied in each period assuring their active participation in the local market. Pricing mechanisms analyzed were local merit-order with a staggered pricing system using levelized costs of electricity, and power purchase agreements. Reduced Grid fees based on the used grid levels for transmission has been observed to be a key component ensuring the economic viability of the local market.

- Promotion of DERs – the local market should be defined in an economically viable way to promote the installation of distributed renewable energy sources within the FI-REC, ensuring proactive participation of the internal actors within the community.

3.4 Regulation: Alignment of legislation on the organization of the REC

With the integration and harmonization of RECs with the power grid and energy market, current legislation on European level needs to be updated and aligned.

Action point: Check which revision of parts of organizational rules of RECs are needed with respect to European level legislation, e.g., Renewable Energy Directive (EU) 2018/2001.

Action point: Evaluate contractual issues clarifying the rights and responsibilities between the energy community and DSO, energy community and external energy trader, provisions of local market establishment and power purchase agreements among EC members.

3.5 Policy: Supporting pilots of fully integrated energy communities

Energy community pilots are used to prove the concept and to develop the solution, becoming as attractive as possible for the participants of a large-scale roll-out. Framing conditions of the pilot should be adaptable to match local visions and goals in social and environmental regard. Disseminate information about results and verified benefits to justify large-scale rollout.

To efficiently support the larger rollout, setting up monitoring systems should be considered in the design phase of the pilot. They should record data to be communicated to all potential stakeholders. They should preferably show benefits for the individual members, the community, and external stakeholders such as municipalities, DSOs etc. These benefits should not be limited to economic benefits but have a larger scope. Results should be disseminated continuously as soon as they can be confirmed. The communicated results must be robust and properly reviewed before dissemination not to risk the trust of the pilot.

Since the pilot, according to the timeline in Table 1, is a parallel process to the development of rules and regulations, it is preferably done in an area that can work as a regulatory sandbox.

Action point: Launch pilots of fully integrated energy communities in suitable locations for proof of concepts. Verify benefits and disseminate information about results.

3.6 Policy: Large scale roll-out of FI-RECs

An implementation strategy will make it possible to set the expectations of market participants. Depending on the results of the pilot, the strategy for large-scale rollout might differ. The target groups and suitable areas targeted should be adjusted according to the results of the pilot. It is important to conceptualize the results from the pilot to make the fully

integrated energy community easy to understand regarding technical requirements, benefits, and organization. Used data needs to be transparent and robust.

During large-scale rollout the most suitable locations should be developed first since it is easier to handle minor drawbacks in certain areas if the benefits outweigh them. This method allows for continuous development of the concept alongside the rollout.

Action point: Set up implementation strategy for large scale role out with clear objectives. Define the most suitable conditions for large scale development and prioritize accordingly.

3.7 Technology: Establish Norms for technology providers

Interfacing between different technology providers due to non-standardized interconnections causes inefficiencies and is one key-aspect triggering lack of acceptance of technical solutions.

Action point: Set standards for technology providers, e.g., European Norms, to incorporate features of the chain control over the entire power grid (high-, medium- and low voltage), producing and storage facilities, and the customer plant management unit.

3.8 Regulation: Legislation and Grid Codes

Action point: Set national targets and develop strategies for implementing and deploying FI-RECs. Adapt grid codes accordingly.

3.9 Stakeholder integration: enable and facilitate participation

Stakeholders are key to successful implementation of EC, therefore supporting interested parties to assume their roles should be mediated and facilitated. Pilot implementations will likely be fostered through local agents with high motivation, trusted by the community. Set a fruitful and reliable environment, supporting structures, and contact points/umbrella organizations for capacity building. Framing conditions should be adaptable to match local visions and goals, social and environmental.

Action point: Establish pilot implementations that serve as best practices and pave the way for future implementations.

Action point: Support trusted intermediaries (community leaders, local heroes, etc.) in guiding role to establish energy communities that consequently lead, build, and continuously nourish communities.

3.10 Policy: Continuous improvement:

As FI-RECs are a new element, a continuous improvement process should improve and respond to new technological advancements and challenges arising over the years.

Action point: Continue research activities to respond to new advancements and challenges, by updating and implementing technical norms, market rules and contractual requirements.

Action point: Enable research on new, potential services of FI-RECs that may offer new quantifiable economic benefits to the community, further advancing it step by step.

4 References and Further Information

All INTERACT project information: www.ped-interact.eu

4.1 INTERACT Project Deliverables

[D2.1] Competence map and showcasing of successful PED projects

[D2.2] Stakeholder needs evaluation of focus districts

[D2.3] Key success factors and requirements for INTERACT energy communities

[D3.1] Common inventory methodology for recording current technologies

[D3.2] Gap analysis including existing technologies/infrastructure and necessary replacements/upgrades/additions

[D3.3] LINK-ICT structure with communication guidelines between the actors within the electricity community

[D4.1] Design of the fully integrated energy community organization

[D4.2] Use Cases for the integration of the existing technologies with the LINK-solution

[D4.3] Market structure and its interfaces with the fully integrated energy community

[D5.1] Current legal framework and differences between the PED-Call target countries

[D5.2] Business cases for the INTERACT energy communities

[D5.3] Required contracting models and economic evaluation of the solution

4.2 Roadmap References

[1] European Commission, 2017, Commission Regulation (EU) 2017/2195 of 23.11.2017 establishing a guideline on electricity balancing

[2] European Commission, 2022, Electricity market design, available online: Electricity market design (europa.eu) (last accessed December 6th, 2022)

[3] Oberthür, S., Söebech, Ó., Soria Rodriguez, C., Iozzelli, L., & Moreno, J. E. (2022). Advancing the Energy Transition: The European Legal Framework for the Implementation of Energy Communities. (Energy Research and Social Science). Brussels School of Governance, Vrije Universiteit Brussel. https://brussels-school.be/publications/other-publications/advancing-energy-transition-european-legal-framework-implementation (last accessed January 9th, 2023)

[4] Ilo, A., Schultis, D. L. (2022). A Holistic Solution for Smart Grids based on LINK–Paradigm (Springer International Publishing). ISBN 978-3-030-81529-5, DOI: https://doi.org/10.1007/978-3-030-81530-1

[5] Bremdal, Olivella-Rosell, et.al, Creating a local energy market, October 2017CIRED - Open Access Proceedings Journal 2017(1):2649-2652, DOI: 10.1049/oap-cired.2017.0730

5 Built-up Area: Specific Case Großschönau

Großschönau is a rather small but very well-known rural municipality in Austrian Waldviertel. It has been promoting sustainable and environmentally friendly ways of living since decades. Großschönau is rated an e5-municipality, has won the European Energy Award in Gold for its achievements in energy efficiency, and has two nationwide renowned showcase projects of sustainable thinking and acting – the BIOEM fair and the permanent exhibition SONNENWELT.

5.1 Status regarding resources, technology, and community building

As described in detail in D2.3, it is apparent that many different aspects in relation to a community organization, a leading role and competencies are available and widespread within the community with regards to identifying factors contributing to the success of the municipality in the field of sustainability and energy efficiency in Großschönau. Next to the advantageous available community and social cohesion, also two different basic energy communities in accordance with the Austrian law are existing in Großschönau as of today. From a technology point of view, as described in D3.2, a fiber-to-home network is existing within the whole municipality, owned by the municipality itself, enabling the set-up of new services for all citizens. The technical link to the power grid – the Customer Plan Management Unit (CMPU) as well as the commercial link to the energy market still need to be developed.

5.2 Step by step action plan to set up an INTERACT EC

Based on our definition of success – *"An **accepted** and **viable** energy community which operates in harmony with the grid, optimizes the use of local energy resources, creates flourishing local markets, brings environmental, economic and social benefits for its members, and fosters energy transition towards carbon neutrality"*, [D2.3] – we outline in Table 2 suggested steps to use and bundle the available resources to advance the existing energy communities towards a fully integrated renewable energy community FI-REC.

Table 2 – Step by step action plan for focus region Großschönau

Type	Category	Local Possibilities	Dependencies on others
Internal	Technology	✓ Set up community services via the available fiber to home network ✓ Support further installations of DERs ✓ Stock take of available flexibilities (storage, controllable loads)	✓ Prototype of CPMUs together with technology provider, scientific lead, and distribution system operator (DSO) ✓ Receive access to automated measurement data from the DSO
	Organisation	✓ Agree on fair and transparent rules regarding membership access, decision making, and distribution. ✓ Put in place dedicated project officer with time and expertise ✓ Open the energy community step by step to additional members	✓ Connect to the energy market as soon as regulations allow, providing additional financial means to the energy community by offering balancing and flexibility services to the grid via the respective exchange

		✓ Finetune and automate administrative processes to save time and resources ✓ Visit other community energy projects as best practice ✓ Join associations supporting the implementation of energy communities, installation of DERs, usage of flexibilities, and accordingly adoptions of energy market rules	
	Motivation	✓ Show realistic financial aspects related to the energy community to manage expectations ✓ Show and contribute to realistic non-financial benefits (individual- and community- related) and environmental benefits ✓ Organize events and community building actions in line with member requests and availabilities	---
External	Sociocultural environment	✓ Keep local council support ✓ Present and showcase the project and its results at all levels ✓ Engage knowledge building and networking between stakeholders and interested persons	---
	Regulation	✓ Include rules and recommendations regarding energy sharing and energy autarky in the city development plan	✓ Establish a local market supporting flexible pricing strategies as soon as technology and regulations allow ✓ Connect to the regional energy market as soon as regulations allow
	Funding	✓ Run viable operations with low-cost administration, supported by sponsors and/or voluntary help	✓ Use grid fee reductions as they are made available by national rules ✓ Find and use funding and supporting schemes for installation and operation of energy communities and DERs ✓ Find and use funding and supporting schemes for creating the needed technological and market links to fully integrate the energy community

With the above-described steps, Großschönau can improve its currently available basic energy community to an advanced operation state. Supported with further research and technical expertise, the CPMU can be prototyped and tested, and so the integrated state reached. To reach a fully integrated operation, a connection to the energy market is needed, which might be possible with the help of regulatory sandboxes, an instrument enabling the testing of new market rules in a professional and scientific way.

6 Greenfield Project: Specific Case Fyllinge

Fyllinge is part of the city of Halmstad, which is located on the west-coast of Sweden. It is a greenfield real estate development project with focus on innovative energy technology solutions, such as hybrid solar panels and geothermal heating. As of now, the legislative framework for creating an energy community is missing in Sweden. Nevertheless, the municipality in Halmstad sees energy communities as opportunity to further develop housing areas with a minimum expansion of grid capacity. The DSO has a focus on maintaining grid stability when adding new development projects, as in the case of energy communities.

6.1 Analysis of strategic fit and planned technologies

With a greenfield project the power grid design and its connection points for an energy community can be tailored as needed. Also design the buildings can be designed for optimal energy production and maximal energy storage. The vision for Fyllinge area is that the buildings will be heated either by geothermal heat or district heating, depending on their availability, price, and environmental burden at each given moment. Solar PV on planned for all available rooftops and shall supply 90% of the areas total electricity need over the year.

6.2 Step by step action plan to set up an INTERACT EC

Conditions for setting up an energy community for a greenfield project differ from an already built-up area to some extent. There exist also some regulatory differences between different countries. In Table 3 steps to form a successful energy community are listed for the greenfield project in Fyllinge, Sweden. It shows local possibilities and external dependencies for different categories, such as technology, organization, motivation etc.

Table 3 - Step by step action plan for focus region Fyllinge

Type	Category	Local Possibilities	Dependencies on others
Internal	Technology	✓ Set up community services via a local network. ✓ Define optimal production, storage and flexibility within the planned area. ✓ Encourage DER and other actors to build according to the optimal definition, by rules or incentives.	✓ Prototype of CPMUs together with technology provider, scientific lead, and distribution system operator (DSO) ✓ Receive access to automated measurement data from the DSO ✓ Promote the idea of acceptance of longer payback times for investment of the area developers
	Organisation	✓ Create an EC according to best practice with fair and transparent rules regarding membership access, decision making, and distribution. ✓ Use the presence of an EC to attract engaged members. ✓ Facilitate a structured hand over of the existing EC to its future members.	✓ Connect to the energy market as soon as regulations allow, providing additional financial means to the energy community by offering balancing and flexibility services to the grid via the respective exchange ✓ Establish an early, formal agreement with the DSO for planning and support

		✓ Put in place dedicated project officer with time and expertise, preferably in collaboration with the DSO and experts from various fields. ✓ Visit other community energy projects as best practice. ✓ Create connections to associations supporting the implementation of energy communities, installation of DERs, usage of flexibilities, and accordingly adoptions of energy market rules.	
	Motivation	✓ Show realistic financial aspects related to the energy community to manage expectations ✓ Show potential non-financial benefits ○ Environmental ○ Energy Security ○ Self sufficiency ✓ Organize events and information opportunities for potential future EC members ✓ Communicate the state-of-the-art development	---
External	Sociocultural environment	✓ Ensure support from local actors, mainly municipality ✓ Relate to local target set by the municipality or region ✓ Engage knowledge building and networking between stakeholders and interested persons	---
	Regulation	✓ Include rules and recommendations regarding energy sharing and energy autarky in the detailed development plan	✓ Establish a local market supporting flexible pricing strategies as soon as technology and regulations allow ✓ Connect to the regional energy market as soon as regulations allow
	Funding	✓ Run viable operations with low-cost administration, supported by sponsors and/or voluntary help	✓ Use bilateral agreement with the DSO to benefit from potential revenue in reduced expansion costs. ✓ Find and use funding and supporting schemes for the installation and operation of DER ✓ Find and use funding and supporting schemes for creating the needed technological and market links to fully integrate the energy community


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