INTERACT

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

D 4.1 Design of the Energy Community Organization according to the *LINK*-Solution

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Leader: TU Wien

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Executive Summary

Within this deliverable “Design of the Energy Community Organization according to the *LINK*-Solution" we give a comprehensive overview about the organizational structure of Energy Communities, INTERACT Energy Communities and finally the two specific INTERACT Energy Communities in the demo-sites in Austria in Sweden. This deliverable is the first of Work Package 4 - “Design of the *LINK*-based Energy-Community with respect to Stakeholder Needs” and will be followed by two deliverables, firstly describing use-cases of the INTERACT-Energy Community and secondly showing the Market Structure and its interfaces with the Energy Community.

After a short introduction into the document in Chapter 1, we show in Chapter 2 the current state-of-the-art organizational structures of Energy Communities. We follow within the document a categorization in i.) Definitions, ii.) Activities, iii.) Ownership, iv.) Value creation & sharing and v.) Barriers. After describing these categories for the state-of-the-art Energy Communities, we follow with additional information from the stakeholder interviews at the two project-demo-sites. Here we summarize the relevant aspects and inputs regarding their desired / expected structure on a local level.

Within Chapter 3, the core of this deliverable, we define the INTERACT Energy Community in relation to the current existing definitions of Energy Communities. Based on this definition we derive a full set of possible activities of the INTERACT Energy Community. We show different possibilities of INTERACT Energy Communities owning assets and/or operating with member-assets. We show the embedding of the INTERACT Energy Community into the LINK-Architecture, describe the Roles within the INTERACT Energy Community and describe value creation and value sharing within the community.

In Chapter 3 the general structure and full-set of possibilities of the INTERACT Energy Community is applied to the specific demo-sites in Großschönau, Austria and Fyllinge, Sweden. Based on the information available, the individual sub-set of activities, ownership-models and roles is described for each demo-site.

The information gathered and developed within this document will be one vital contribution to the final Deliverable 6.1 - “Roadmap for the implementation of the designed INTERACT energy community in general and for the specific local perspectives” as it covers the principal organizational elements, activities, functions and roles of the INTERACT Energy Community, and builds as well the starting point for use-cases and economic valuation.

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List of Abbreviations and Acronyms

CEC	Citizen Energy Community
CP	Customer Plant
CPO	Customer Plant Operator
DER	Distributed Energy Resource
DSO	Distribution system operator
EC	Energy community
ECC	Energy community chairman or woman
EHV	Extra high voltage
EPO	Electricity producer operator
ESCO	Energy service company
ESO	Electricity storage operator
EV	Electric vehicle
HV	High voltage
HVSO	High voltage system operator
LEM	Local electricity market
LV	Low voltage
LVSO	Low voltage system operator
MV	Medium voltage
MVSO	Medium voltage system operator
REC	Renewable Energy Community
SME	Small- and medium-sized enterprise
StO	Storage Operator
TSO	Transmission System Operator
WP	Work package
WT	Wind turbine

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1 Introduction

1.1 Purpose of the document

This document develops the generalized structure of the INTERACT Energy Community based on the *LINK*-Solution and a comprehensive literature research concerning state-of-the-art Energy Communities. This generalized structure shall facilitate the setup of the Energy Community organization in different locations, and thus on a large-scale. Based on the results of questionnaires conducted in the pilot regions, the corresponding specific structures of the INTERACT Energy communities are derived from the generalized one.

1.2 Relation to other project activities

The organizational setup of the INTERACT Energy Community in both pilot sites is specified based on the stakeholder needs, which are identified within WP2.

The developed organizational setup is the basis for many following project activities: it allows to define Use Cases for the integration of existing technologies (WP4), the interfaces between EC organs and the local electricity market (WP4), and business cases (WP5). It will be part of the roadmap for the implementation of INTERACT Energy Communities (WP6).

1.3 Structure of the document

Section 2 presents the literature review concerning state-of-the-art Energy Communities and the results of the questionnaires conducted within both pilot sites. The generalized structure of the INTERACT Energy Community is specified in section 3, and the specific structures of the INTERACT Energy Communities in both pilot sites are derived from the generalized one in section 4.

2 Investigation of the EC organization structure

2.1 State-of-the-art ECs

2.1.1 Definitions

The term 'Energy Community' covers a wide range of energy-related activities and ownership structures and is interpreted differently across contexts and sectors [1]. It generally involves participative decision-making and community ownership and aims to create benefits for its members and the environment [2]. Communities are separated into communities of locality and communities of interest, which vary concerning the geographic dispersion of their members. While the former is locally confined, the latter may be widespread. Such communities allow citizens and local authorities to actively and beneficially participate in the energy transition process.

2.1.1.1 Evolving terminology

The terms' local energy community', 'citizen energy community', and 'renewable energy community' evolved in the European legislation as presented in Figure 1.

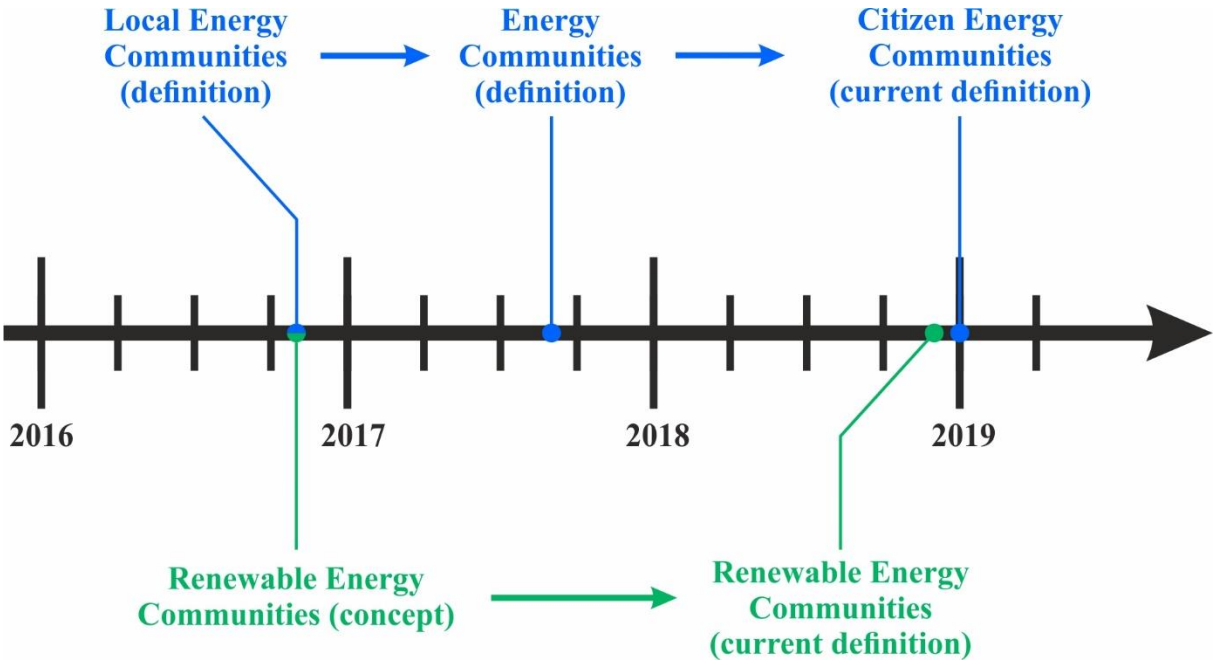

Figure 1: Evolvement of the Energy Community definitions.

In November 2016, the European Commission proposed to define **Local Energy Communities** as "an association, a cooperative, a partnership, a non-profit organization or other legal entity which is effectively controlled by local shareholders or members, generally value rather than profit-driven, involved in distributed generation and in performing activities of a distribution system operator, supplier or aggregator at local level, including across borders" [3]. However, the terms "local shareholder", "local member", and "local level" remained undefined.

Almost one year later, in September 2017, the Council of the European Union changed the proposal of the European Commission by defining **Energy Communities** as "a legal entity

which is effectively controlled by shareholders or members who are natural persons, local authorities, including municipalities, or small and micro enterprises. At least 51% of the shareholders or members with voting rights of the entity are natural persons. Energy communities can be engaged in electricity generation, distribution and supply, self-consumption, aggregation, storage or energy efficiency services, generation of renewable electricity or provide other service to its shareholders or members" [4]. This definition defuses the geographical limitation of the Local Energy Community by allowing non-local natural persons and small and micro enterprises to participate in the Energy Community.

In April 2019, the Council of the European Union refined its definition by renaming the Energy Community **Citizen Energy Community** [5], which is "a legal entity that:

- 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;
- 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
- 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".

This definition is included in the final Directive (EU) 2019/944, which is currently in force.

In parallel, the European Commission proposed the concept of **Renewable Energy Communities** in November 2016 without providing a concise definition [6]. In December 2018, the Directive (EU) 2018/2001 [7], which is currently in force, introduced the definition of Renewable Energy Communities as "a legal entity

- which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by members or shareholders that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;
- the shareholders or members of which are natural persons, SMEs or local authorities (including municipalities); and
- the primary purpose of which is to provide environmental, economic or social community benefits to its shareholders or members or for the local areas where it operates, rather than financial profits."

2.1.1.2 Current definitions

The Renewable Energy Directive (EU) 2018/2001 [7] and the Internal Electricity Market Directive (EU) 2019/944 [8], recently adopted as part of the European Commission's Clean

Energy Package, provide the current definitions of energy communities by distinguishing between **Renewable Energy Communities** (REC) and **Citizen Energy Communities** (CEC).

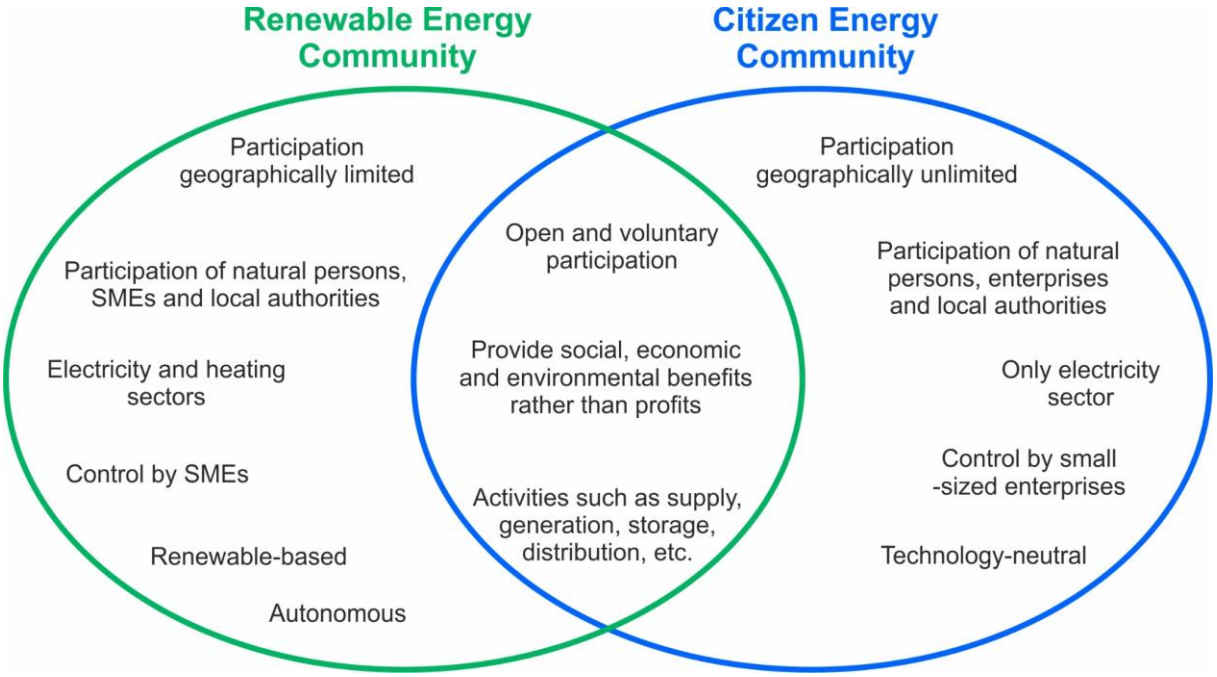

Figure 2: Renewable and Citizen Energy Communities according to EU legislation.

Participation in both types of energy communities is generally open and voluntary, while their purpose is to provide social, economic and environmental benefits to the community members or shareholders rather than profits. Typical community activities include supply, generation, storage, distribution, etc.

Renewable Energy Communities are geographically limited and organized in the proximity of renewable energy projects owned and developed by that community. Natural persons, including low-income and vulnerable households, local authorities and small- and medium-sized enterprises (SME) may participate. RECs cover a broad range of activities referring to all forms of renewable energy in the electricity and heating sector. They are effectively controlled by SMEs while remaining autonomous from individual members and other traditional market actors who participate in the community as members or shareholders.

Citizen Energy Communities mainly differ from the renewable ones by their geographically unlimited character, their focus on the electricity sector, and their technology neutrality. Any actor may participate as long as members or shareholders engaged in large-scale commercial activity and for which the energy sector constitutes a primary area of economic activity do not exercise any decision-making power.

2.1.2 Activities

Table 1 overviews the activities of existing energy communities [1], [9]. Whereas the EC, as a specialized entity for production, storage, distribution, and sales of energy, will normally perform these activities in-house, side activities like administration and accounting might also be outsourced to reduce the complexity of the organization.

Table 1: Activities of state-of-the-art Energy Communities

Activity	Description
Production	Community-run production facilities produce electricity or heat.
Storage	Community-run storage facilities store electricity.
Distribution	Management of distribution networks owned by EC, such as local electricity grids or small-scale district heating and gas networks.[1]
Energy sale	The produced or stored electricity is fed into the grid and sold to a supplier.
Self-consumption	The produced or stored electricity or heat is consumed within the community.
Supply	Energy (e.g., electricity, wood pellets, biogas, heat) is sold to customers.
Aggregation	Aggregate customers to enable their participation in the market.
Services	Financial and energy-related services, such as renovating buildings, energy auditing, consumption monitoring, heating, and air quality assessments, are offered to customers.
Ancillary services	Provision of ancillary services to support the grid operation.
E-mobility	Car sharing, car-pooling, management of charging stations, provision of e-cars for members and cooperatives.
Administration and Accounting	All legally and organizationally required work to run the EC: bookkeeping, membership administration, tax reporting, other reporting duties to owners, members and authorities, etc.
Others	Consultation services to develop community ownership initiatives or establish local cooperatives, information, awareness-raising campaigns, etc.

[1] According to the Third Energy Package, the electricity system is built on the separation between regulated (transmission and distribution system operators) and unregulated (supply activities), except for small distribution system operators with less than 100,000 customers.

2.1.3 Ownership

State-of-the-art Energy Communities may own several assets, which are described in section 2.1.3.1. This ownership may be organized based on the legal forms overviewed in section 2.1.3.2.

2.1.3.1 Community-owned assets

Table 2 lists and describes the assets that may be owned by state-of-the-art Energy Communities. Table 2

Table 2: Assets that may be owned by state-of-the-art Energy Communities

Asset	Description
Distribution networks	Electricity grids, gas networks, and district heating networks.
Metering devices	Metering devices for electricity, gas and heat.
ICT infrastructure	Communication infrastructure (e.g., fiber optic cables) and information technologies (e.g., servers).
Distributed energy resources	Producers and storages of electricity, gas, and heat.

Land	A piece of land which may be used for community-owned installations (e.g., PV plants or stationary battery storage) and buildings (e.g., office buildings).
Buildings	Offices for the administration and management of the EC.
Intellectual Property	Patents, Designs, and/or Brand Rights.

2.1.3.2 Legal ownership forms

Depending on the size and strategic target of the EC, they might either be attached to an existing entity or organized by setting up a new entity.

Existing entities that can add EC to their portfolio include:

- The local municipality office, or a municipality-owned company like a City-Infrastructure-Company or City-Service-Company;
- Existing local associations like a village renewal or an urban renewal association, a neighborhood club, etc.;
- Existing local companies benefitting from the EC or interested into the EC, like energy advisors, or owners of large DER, etc.

Each country offers a wide choice of different legal forms of organizations for a newly created entity. The analytical credit dataset of the European Central Bank lists in its 2.6 version of the "list of legal forms" 958 different legal forms in the 28 countries covered [10]. Due to the community aspect of the EC, sole proprietorships are out of the question.

The different ownership models can be very generally classified in accordance with the following aspects:

- Influence of the owners on the business
    - From direct influence and participation in daily business
    - To indirect influence without participation in daily business
- Liability of the owners resulting from the business:
    - Full personal liability
    - Limited personal liability
- Formality of the ownership model:
    - Need to register a separate legal entity?
    - Taxation of the owners or taxation of the organization?
- Duration of the ownership model
    - Ending foreseen (e.g., by leave or death of a partner)
    - Ending not foreseen

Considering these aspects, the selection of the type of organization shall be well thought through, as a change of the model when the EC is already in operation for some time might be more costly and will have more complex taxation and legal issues to be considered.

The below table 3 shows and describes the main different possible ownership model categories of ECs, while table 4 shows different specific ownership models used in EC projects:

Table 3: Main legal ownership categories of state-of-the-art Energy Communities

Ownership model	Description	Ref.
Partnerships	Partnerships may be 'limited' or 'joint and several'. Partnerships tend to be governed by a management board, with the ownership rights dependent on the financial investment of each partner. The use of a partnership model has several benefits, including the possibility of certain tax advantages, the equal distribution of responsibilities and profits, and the ability to ensure decision-making is more democratic and transparent than that of a traditional company. Bylaws of the partnership may establish limitations on ownership, determine how decisions are made, and stipulate who may participate. For instance, in Germany, limited partnerships with a private company as a general partner are a commonly used structure for community energy, while in Denmark, energy partnerships often function under the title of 'association'. **Limited partnership**: A partnership may allow individuals to distribute responsibilities and generate profits by participating in community energy. Governance is usually based on the value of each partner's share, meaning they do not always provide for a one member – one vote. Limited partnerships with a limited liability company as a general partner are suitable for larger projects with high investment volume. It became particularly popular for citizen-owned wind parks in Germany. Voting rights are proportional to the capital invested, instead of the traditional 'one member – one vote' cooperative principle. **Public-private partnership**: Local authorities can decide to enter into agreements with citizen groups and businesses in order to ensure energy provision and other benefits for a community. Strengths: Local authorities can help to de-risk the initial investment in projects, provide grants and collaborate to secure external funding; local authorities can provide practical planning support and share public land. Weaknesses: Local energy communities vary in terms of their understanding of community energy; inconsistent application of planning rules and consent across different local authorities can be challenging.	[1], [9]
Corporations	**Corporations** are one of the most common forms of organizations. Their main distinction to partnerships is that they form a legally approved single entity and act as a legal person in front of the law. Types of corporations vary by country; the two most typical are limited companies and stock companies. **Limited Companies** or **private limited companies** are the majority of existing companies. The main benefit for the owners is that their share of the company limits their risk. The company itself has a legal status and acts as a legal person and guarantees with its own assets for its own actions. Accounting rules and business rules are given by national laws and can vary. In general, private limited companies are rather easy to incorporate, have rather few obligations, and provide a sustainable and self-standing basis for any business. **Stock Companies** or public limited companies are an organizational form mainly for larger companies with the main advantage that its shares are designed to be easier traded. There are higher demands regarding	[11], [12]

	accounting, reporting and auditing compared to private limited companies. Given the company meets the prerequisites, public limited companies can trade their shares also on formal stock exchange markets.	
Cooperatives	**Cooperatives** are the most common form of organisational structure adopted by community energy initiatives. They constitute democratic structures that follow a set of internationally agreed principles and make decisions on a one-member-one-vote basis; an elected board governs day-to-day operation. In general, they allow a moderate return to investors, and require fewer administrative and legal requirements than that of a private company. Cooperatives primarily benefits its members. It is popular in countries where renewables and community energy are relatively advanced. Cooperatives are a type of social and economic enterprise that enables citizens to collectively own and manage renewable energy projects. Local residents or from the neighbouring area can invest in renewable generation by buying shares to finance a project. In some cases, citizens can also consume and share renewable energy. In a cooperative, the distribution of profits is limited and surpluses are reinvested to support its members and/or the community. The allocation of revenues from the projects is regulated by the statutes of the cooperative, which relate to its main purpose. Sometimes they can be distributed amongst the members through capped dividends. Other initiatives may provide energy benefits in the form of lower energy prices. Cooperatives are based on democratic governance, i.e., decisions are made on a 'one member – one vote' principle. Strengths: Voluntary and democratic structure (one member one vote); common economic, social and cultural goals can be met. Weaknesses: Raising sufficient capital for investment can be a challenge; lack of familiarity with RE and technical skills/knowledge can be an issue.	[1], [9]
Community trusts and foundations	Their objective is to generate social value and local development rather than profits for individual members. Profits are used for the community as a whole, even when citizens do not have the means to invest in projects. To ensure that returns on investment and benefits from community energy projects support the local community, ownership models in the form of trusts and foundations are most suitable. These organisations are intended to act for the broader community benefit (as opposed to the profit of particular members) and allow the profits from the renewable energy project to be reinvested back into the local community for specific local ventures – this ensures that even those citizens who do not have the capital to invest directly benefit from community energy.	[1], [9]
Associations	**Associations** are a group of individuals and/or legal persons who enter into agreement to form a common structure and pursue a common goal or purpose. They can be registered or non-registered. Associations can vary from small informal, local hobby groups to large multinational interest groups. Associations are owned by its members, who might be asked to pay a fee for financing the operations of the association. Members may be differentiated in groups based on the statute of the association. Common membership groups are ordinary members with or without voting rights, supporting members with or without voting rights, or preferred members with or without voting rights. Differentiations can be made by the amount of the membership fees, by the benefits originating from being a member, or by the voting rights. Minimum requirements for registered associations can differ country by country, and may e.g., include general meetings for all members, financial auditors, natural persons as executives, etc. Due to its rather flexible and easy structure but still with the possibility to establish more complex business rules, associations might be a good choice for setting up state-of-the-art Energy Communities.	[13]

Table 4: Specific legal ownership forms used in state-of-the-art Energy Communities

Ownership model	Description	Ref.
Non-profit customer-owned enterprises	One specific type of a cooperative with legal structures used by communities that deal with the management of independent grid networks. Ideal for community district heating networks common in countries like Denmark. In such a non-profit ownership model, profits may be returned to the members in the form of lower energy prices. Non-profit, customer-owned enterprises follow the framework of cooperatives with the addition of specific rules. For example, the organisation's rules might stipulate that 'ownership might require grid connection or votes may be capped to limit the power of individuals who own multiple properties', making this setup particularly suitable for community projects that rely on independent grid networks.	[2], [9]
Housing associations	Non-profit associations that can offer benefits to tenants in social housing, although they may not be directly involved in decision-making. These forms are ideal for addressing energy poverty. Housing associations can also act as a model of local energy. They operate as private, non-profit organisations that can 'finance community renewable energy projects by adjusting tenant rents' and can be instrumental in addressing social issues such as fuel poverty. However, residents sometimes have only limited control over decisions of the housing association, which can act as a barrier to such a model becoming successful within the community. Such a system can be found, for example, in social housing estates in Denmark, where tenants are members of a housing association and can take decisions concerning the management of the estate.	[1], [9]
Economic Association	An economic association is a type of business in which the members' liability is limited to the capital invested in the association. An economic association can be started by at least three people, companies or associations. An association is represented by a board of directors consisting of at least three members and at least one auditor. This form is the suggested form for ownership in the Swedish legislation proposal	[17]
Municipal ownership	Municipal ownership allows more political involvement in the local energy market and more control over the local energy systems.	[9]
Community charities	Community charities usually form an association with charitable status that provides or runs facilities for the local community, such as village hall associations that use renewable energy to heat or power their buildings. Such charities can also have trading arms or community interest companies to provide local services.	[14]
Development trusts	These have been particularly used in Scotland to represent communities' interests in revenue-generation enterprises, and in some cases, this has been extended to include variants of community ownership. The community group is usually the full owner of the renewables installations and raises funds through grants and loans, and distributes income from renewables to community projects.	[1], [14]

Shares owned by a local community organisation	The gifting of shares in a commercial project to a local community organisation such as a trust, or in the case of wind farms, the gifting of one of more turbines, has been used as a way of providing a community benefit that is closely tied to the performance of the production unit Part-ownership by the community may confer only limited rights to control or to make inputs into decision making.	[14]
Public utility company	Public utility companies are run by municipalities, which invest in and manage the utility on behalf of taxpayers and citizens. These forms are less common but are particularly suited for rural or isolated areas.	[1]
Others	Community energy ownership can take other legal forms led by companies, social enterprises, or citizens, depending on the national circumstances and laws. For instance, public and private limited liability companies are gaining popularity (especially in Europe and North America) as a form of ownership attractive to investors who wish to limit their liability, whist simultaneously protecting private assets from losses.	[9]

2.1.4 Value creation and sharing

Energy Communities aim to create values for the environment and its members. An overview of these values is given in section 2.1.4.1. The financial values created based on community-owned assets must be shared between its members in a way that incentivizes community membership. Section 2.1.4.2 overviews the most relevant sharing principles and mechanisms.

2.1.4.1 Value creation

Table 5 categorizes the values that state-of-the-art Energy Communities may create into economic, environmental, and social ones.

Table 5: Values created by state-of-the-art Energy Communities

Category	Value	Description	Ref.
Economic	Cost reduction	Local energy usage reduces the power transfer through the grid and thus the corresponding system usage charges. Increased efficiency of energy end-use (e.g., through building refurbishment) reduces energy costs. Furthermore, the electricity price may be lower in the local market.	[1], [9]
	Revenue generation	Sell of energy and ancillary services (flexibilities) generates revenues. Tax revenues generate income for the municipality.	[2], [9]
	Job creation	Employees are necessary for the administration of the EC and the installation, operation, and maintenance of the technical systems.	[2], [9]
	Stimulation of the local economy	The use of local resources and the generation of local income stimulate the local economy.	[2], [14]
Environmental	Reduced CO_2 emissions	The increased share of renewables within the community and the increased efficiency of the	[11]

		overall power system reduces the global CO_2 emissions.	
	Improved infrastructure utilization	Local energy usage reduces the need for transmission and distribution infrastructure.	
	Improved waste management	Producing energy from waste and biomass residues improves the local waste management. The re-use of decayed EV batteries allows for community storage.	[11]
Social	Energy independence / autonomy	The community is less dependent on big generation companies.	[11]
	Social cohesion	Energy communities may strengthen social cohesion by promoting community building, social inclusion, and the development of a collective community identity.	[2], [15]
	Education	Energy communities may improve citizens' understanding of the energy system and increase their awareness for energy-related issues. Ultimately, members may shift to a more sustainable lifestyle. Increased acceptance of EC members for new installations (such as community-owned PV and WT systems).	[2]
	Energy access	ECs generally aim to provide benefits for the local community rather than maximizing profits. Therefore, they are in a better position to combat energy poverty than traditional utilities.	[9], [15]
	Energy democracy	ECs promote energy democracy by involving citizens in decision-making and creating social and environmental benefits.	[9], [15]
	Security of supply	ECs can enhance security of heat, cooling and electricity supply at the local level.	[11]
	Self-determination	The community members are involved in the decision-making process, thus having a higher degree of self-determination compared to a centralized energy system.	

2.1.4.2 Value sharing

All values described in Table 5 can be categorized into financial and non-financial values. While non-financial values may be hard to estimate, the financial ones must be shared fairly among the community members to maintain the equity and stability of the EC [16]. In an unstable EC, unsatisfied members may prefer opting out of the EC and may even create a smaller one on their own. An EC is stable when financial values are shared by transparent and understandable procedures so that:

- Each member receives more than it would receive after opting out of the EC.
- Each subgroup of members receives more than it would receive after creating an EC on its own.

Financial values can be shared based on simple (e.g., each member receives equal or pro-rata values) or more sophisticated allocation rules (marginal contribution and Shapely value).

The marginal contribution allocation rule gives each member a share of the whole value proportionally to its marginal contribution to the whole community. The Shapely value allocation rule gives each member a share of the whole value proportionally to the average of all its marginal contributions to all possible subgroups of members. While the sophisticated allocation rules ensure the stability of the EC, the simple ones fail to do so. Ref. [16] recommends implementing the marginal contribution allocation rule due to its simplicity.

2.1.5 Barriers

Table 6 lists and describes potential barriers that may hinder the establishment of Energy Communities.

Table 6: Barriers for establishing state-of-the-art Energy Communities

Barrier	Description	Ref.
High operating costs	The costs for administration and operating the technical system may impair the profitability of the EC.	[2]
Discrimination	An inappropriate market design may discriminate the EC members against each other and the whole EC against other market participants (such as big generation companies).	[2]
Lack of political support	Legal barriers such as complex funding acquisition processes and bureaucratic procedures may hinder the establishment of ECs.	[2], [15]
Lack of institutional support	Existing institutions may favor centralized energy systems instead of supporting the establishment of ECs.	[2], [15]
Lack of resources	Lack of time, funding, and expertise. High up-front costs. Lack of space for new installations.	[2] , [11]
Skepticism to renewable energy	Citizens may refuse new RE installations such as wind turbines.	[2]
Resistance from community	Citizens may refuse the establishment of an EC when it does not align with the local interests, e.g., when the costs and benefits do not boil down to the same actor.	[15]
Dependence on voluntary work	ECs rely on voluntary work, which may be hard to obtain.	[2]
Data privacy	Coordination of the CPs' power contributions may impair citizens' data privacy.	
Lack of economic incentives	Citizens may not join the EC when economic incentives are missing.	

2.2 Desired EC structures in both pilot regions

The INTERACT-ECs in both pilot sites are designed in sections 4.1 and 4.2 by considering the needs and motivations of relevant stakeholders, which are identified based on surveys, interviews, and studies.

2.2.1 Großschönau

The needs and motivations of the stakeholders towards participating in an EC in Großschönau are identified by conducting surveys with representatives of stakeholder groups. Further information on the methodology and results are given in Deliverable D2.2. Stakeholder Needs. Following results present an overview and a selection of relevant aspects for the organization of an EC. Overall, 15 stakeholder representatives responded to the survey giving insights on their expectations and needs (see chapter 2.2.1.1). Six of the 15 respondents of the stakeholder survey are currently engaged in planning and conceptualizing an energy community and received more questions on the planning and organizational setup of an EC, such as questions on ownership structure (2.2.1.2) and value creation (2.2.1.4). These six stakeholders come from the municipality and municipal organizations (3), from specialized opinion leader organizations (1), businesses (1), and associations (1).

2.2.1.1 Stakeholders

Seven stakeholder groups are identified as relevant for the EC in Großschönau. They are surveyed through representatives and listed in Table 7.

Table 7: Stakeholder groups relevant for the EC in Großschönau

Stakeholder group	Description
Municipality	Representative of the Municipality of Großschönau, here the mayor.
Municipal organizations and facilities	Representatives from organization, public representation, local council and publicly-owned facilities. Here representatives from local council.
Opinion leader organizations	Regional organisations with focus on climate strategies for municipalities, involved in strategic alliances and information campaigns. Organizations with expertise in the field of energy.
Private Businesses	Local businesses, here from tourism, farming, guest house, information center, local permanent exhibition on energy.
Infrastructure provider	Energy and grid provider
Local associations	Representatives from local associations and clubs, here from tourism and local economic development association, rural youth club, volunteer firefighters
Citizens	Consumers and Prosumers.

2.2.1.2 Activities

The activities of the EC in Großschönau envisioned by the survey respondents are listed in Table 8.

Table 8: Desired activities of the EC in Großschönau

Activity	Details
Production	EC uses local private and public facilities for energy production. Potential future investment in further facilities (private, or publicly owned)
Storage	EC uses local private and public facilities for energy storage. Potential future investment in further facilities (private, or publicly owned)

Self-consumption	Optimized consumption at the community level
P2P Trading	Trading of energy among EC members, improvement of local consumption rate over grid feed-in.
Aggregation	Usage of economies of scale for purchasing / services
Flexibility trading	Integrated prosumer flexibilities

2.2.1.3 Ownership

Five respondents stated their preference concerning the ECs' ownership structure. They expected the EC to be organised as a private enterprise, specifically a partnership or corporation. Additionally, two respondents considered an association or a cooperative as relevant.

2.2.1.4 Value creation

The respondents' preferences concerning the values to be created by the EC in Großschönau are summarized in Table 9.

Table 9: Preferred values to be created by the EC in Großschönau

Category	Value	Details
Economical	Cost reduction	Reduced energy prices in comparison to typical market tariffs very central to all stakeholders
	Revenue generation	-
	Job creation	Safeguard employment in the region with existing opinion leader organizations. No mention of employing administration, installation, operation etc.
	Stimulation of the local economy	Bringing added value to local companies, keeping money within the region
Environmental	Reduced CO_2 emissions	The primary motivator for most stakeholder representatives.
	Climate protection	
	Energy independence & Autonomy	Ensure 100% regional energy supply and become energy neutral by 2030 as defined within municipal strategy plans.
Social	Social cohesion	EC could strengthen local community, benefits for whole community. EC will be a local topic of interest.
	Education	Through the involvement of school and shared information within the community.
	Security of supply	Strengthen local resources, decrease import dependency and secure energy supply for community.

2.2.1.5 Barriers

The barriers to establishing an EC in Großschönau recognized by the survey respondents are overviewed in Table 10.

Table 10: Recognized barriers for establishing an EC in Großschönau

Barrier	Details
High operating costs	Operation costs are yet unclear, as they depend on various unprecedented situations
Lack of institutional support	Burdens from traditional actors, interferences through over-complication of process, high fees for administration, pro-longing the process is feared
Lack of resources	High personal effort for few people, bureaucratic and technical efforts, external consultation costs, lack of expertise and experience
Indifference of community	Willingness to participate could be low, lack of members.
Resistance from community	If goals are not fulfilled, they expect a lack of participation.
Dependence on voluntary work	With operation costs unclear and the EC rather small from the beginning, EC organization will most likely depend on volunteer work from community members. There is worry that individual members might become overburdened with work for the EC, endangering the sustainability of the EC if dependent on few members.
Dependence on external information	Energy Community organizations depend on external information, e.g., at which grid level, prosumer and consumer are connected. Wrong assumptions might result in unexpected costs (e.g., due to different grid-fee reductions).
Lack of economic incentives	Due to unclear costs for investment and operation the economic value is not foreseeable. This leads to fears of unexpected costs, e.g., high fees of infrastructure providers, or additional costs for external consultation. Stakeholders are afraid that there will be zero or very low economic incentive for consumers and prosumers to participate.
Lack of framing conditions	Process information; clear role definitions and functions; framework settings are missing and therefore create uncertainty
Lack of leadership	Various functions are expected to be taken over by a leader, who motivates and engages members and structures the process for others.
Bad reputation	Fear that word of mouth, mal information, and informal gossip could burden the expansion of EC.
Uncertainty	Further burdens and obstacles are being expected by stakeholders, due to the novelty of the approach and the lack of practical experience

2.2.1.6 Roles and functions

Table 11 summarises stakeholders' expectation on roles and functions they could assume within the future EC in Großschönau.

Table 11: Roles and functions envisioned by different stakeholders in Großschönau

Stakeholder group	Roles and functions within the EC
Municipality	Consumer, Operator, Administration Help: Member acquisition, membership administration, accounting, Conceptual Help, Marketing, Community Building
Municipal organizations and facilities	Prosumer, Consumer, Operator, Administration Help: Member Acquisition, Conceptual Help, Accounting, Membership Administration, Community Building.

Opinion leader organizations	Consumer, Motivator, Caretaker, Counsellor, Opinion leader, help with organizations, initiation, marketing, membership acquisition, conceptual help, membership administration, marketing, Community building.
Private Businesses	Producer, Consumer, Pioneer, Multiply idea, (Investor), (Operator) Membership Acquisition, Conceptual Help, Accounting, membership administration, marketing, Community Building
Infrastructure provider	Consumer, operator, member administration, member acquisition, marketing
Associations	Member of an EC, motivation of consumers, information, prosumer, consumer, investor, member acquisition, membership administration, marketing, conceptual help, marketing
Citizens	Producer, Consumer, investor.

2.2.2 Fyllinge

The needs and motivations of the stakeholders relevant for the EC in Fyllinge were mainly identified

- … by interviews with specific stakeholders, and
- … based on studies committed in relation to the coming legislation enabling energy communities in Sweden.

Yet, no EC is planned in Fyllinge. As the legislative framework for ECs in Sweden is still pending, none of the contacted stakeholders were involved in setting up an EC.

In the proposed Swedish legislation, an EC has to be an economical association of the members [17]. This is in conflict with the stakeholder opinion from the surveys that shows that trust in citizens initiatives is low from the DSO and the real-estate developer's perspective.

2.2.2.1 Stakeholders

The three main stakeholders in an early phase of the project are the municipality, DSO and the real estate developer.

2.2.2.2 Activities

The DSO and real estate developer favor the following activities for the EC: E-mobility; production, storage, and distribution of electricity; and the provision of ancillary services. Aggregation may also be necessary to make the EC economically viable.

2.2.2.3 Ownership

The stakeholders expect the EC to be organized like Economic association (see Table 4). This is what is suggested in the legislation proposal and will probably be hard to deviate from

2.2.2.4 Value creation

The real estate developer works according to a concept they call "electric village" where the main goal is to reduce CO_2 and achieve social cohesion in an area so these two will be the main values for the real estate developer. Increasing the amount of renewable energy production is important. The DSO and the municipality are concerned over improving infrastructure utilization and the minimization of grid investment costs. Revenue generation is also seen as important as an enabler of the other values with the possibilities of making the EC commercially viable.

2.2.2.5 Barriers

The main barrier in Fyllinge is expected to be the lack of economic incentives for individuals to join an EC, because there will likely be no tax benefits or other economic advantages. Furthermore, a lack of political and institutional support constitutes potential barriers. The stakeholder mapping showed that neither politics nor institutions believe that EC with play a significant role in the future energy system; this is reflected in the way that laws, regulations and support systems for ECs are proposed.

2.2.2.6 Roles and functions

The DSO will likely own and operate the grid, unless a local DC grid is implemented. The real estate developer will design and implement the original energy system with production and storage. This system is then handed over to the EC when the buildings are sold to the Cooperative housing association. The EC will then be in charge of maintaining, operating and developing community-owned production and storage facilities and supporting members that want to install privately owned production or storage.

3 General structure of the INTERACT Energy Community

3.1 Definition

The definition of the INTERACT Energy Community is an extension of the definition of the Renewable Energy Community (see section 2.1.1.2).

'**INTERACT Energy Community**' 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 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;
(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.

3.2 Activities

The INTERACT EC focuses on the electricity vector. However, the underlying *LINK*-Architecture allows to extend the concept to include other vectors such as gas and district heating [18]. The activities of the INTERACT-EC are summarized in Table 12.

Table 12: Activities of INTERACT-ECs

Activity	Description
Local market operation	Non-discriminatory operation of the local electricity (energy and ancillary services/flexibilities) markets in harmony with the grid and other markets.
Optimizing the short-term operation	Short term planning and optimizing facilities (producers and storages) and prosumers in their area to increase the benefits of the members.
Coordination with the relevant DSOs	Coordination with the relevant DSOs to guarantee a reliable operation in normal and not normal conditions and facilitate the recovering process after a blackout.
Planning of facilities	Long-term planning of producer and storage facilities in the EC area.
Consultancy	Members (customers, EPOs, StOs and CPOs) recruitment and consulting concerning necessary technology upgrades. Advice customers, EPOs, and ESOs concerning necessary technology upgrades.
Community building	Caretaking, bringing members together, promote knowledge exchange between members, etc.
Energy trading	The energy produced or consumed from the facilities owned by EC (producer or storage facilities) may be traded.
Ancillary services/flexibility	Provision of ancillary services/flexibility to support the reliable grid operation.
E-mobility	Management of charging stations.

Administration, Accounting and billing	All legally and organizationally required work to run the EC: bookkeeping, membership administration, tax reporting, other reporting duties to owners, members and authorities, etc.

3.3 Ownership

3.3.1 Community-owned assets

3.3.1.1 Non-electrical assets

INTERACTs EC may own different assets such as ICT infrastructure, land, buildings and intellectual properties, as shown in Table 13.

Table 13: Non-electrical assets may be owned by INTERACT-ECs

Asset	Description
ICT infrastructure	Communication infrastructure (e.g., fiber optic cables) and information technologies (e.g., servers).
Land	A piece of land which may be used for community-owned installations (e.g., PV plants or stationary battery storage) and buildings (e.g., office buildings).
Buildings	Offices for the administration and management of the EC.
Intellectual Property	Patents, Designs, and/or Brand Rights.

3.3.1.2 Electrical assets

The INTERACT EC is distinguished into ECs with, without and mixed ownership of electrical facilities, such as producers, storage and the electricity grid

3.3.1.2.1 EC with ownership of electrical facilities

Figure 3 shows an overview of an EC with ownership of electrical facilities. In this case, the EC acts as a vertically integrated company that owns and operates the distribution infrastructure and DERs. While Table 14 shows the assets which the EC may own.

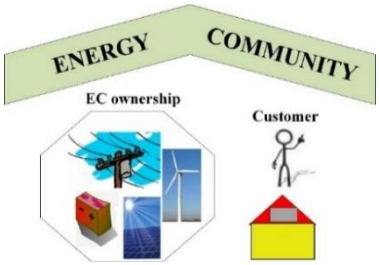

Figure 3: EC with ownership on electrical facilities

Table 14: Assets that may be owned by INTERACT-ECs with ownership on electrical facilities

Asset	Description
Electricity grids	Low voltage grids, including primary (lines, transformers, reactive power devices) and secondary technologies (metering devices, protection devices)
Producers	Producers of electricity.
Storages	Storages of electricity. Three categories are distinguished: Cat. A: The storage injects the power back at the absorption point (e.g., stationary battery storage).

	Cat. B: The storage does not inject the power back at the absorption point (e.g., power-to-hydrogen). Cat. C: The storage reduces the power consumption in the near future (e.g., residential air conditioner).

3.3.1.2.2 EC without ownership of electrical facilities

Figure 4 shows an overview of an EC without ownership of electrical facilities. In this case, ECs do not own or operate any electric facility. DSOs and DERs owners use their facilities based on schedules approved by the corresponding EC.

Figure 4: EC without ownership of electrical facilities

3.3.1.2.3 EC with mixed ownership of electrical facilities

Figure 5 shows an overview of an EC with mixed ownership of electrical facilities. In this case, ECs own and operate different electric facilities. It coordinates its facilities with the DERs owners and customers being community members.

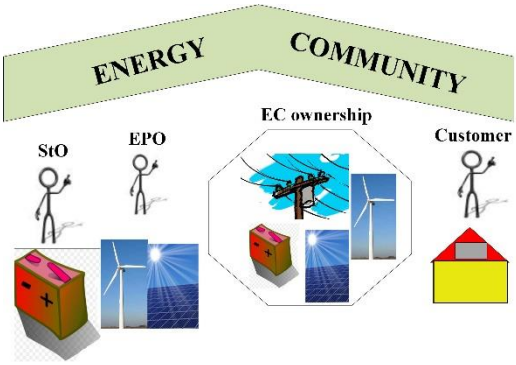

Figure 5: EC with mixed ownership of electrical facilities

3.3.2 Legal ownership forms

Depending on the size and strategic target of the EC, they might either be attached to an existing entity or organized by setting up a new entity.

Existing entities that can add EC to their portfolio include:

- The local municipality office, or a municipality-owned company like a City-Infrastructure-Company or City-Service-Company;
- Existing local associations like a village renewal or an urban renewal association, a neighborhood club, etc.;
- Existing local companies benefitting from the EC or interested into the EC, like energy advisors, or owners of large DER, etc.

Each country offers a wide choice of different legal forms of organizations for a newly created entity, Table 3. Due to the community aspect of the EC, sole proprietorships are out of the question.

3.4 Embedment into *LINK*-Architecture

3.4.1 EC with ownership of electrical facilities

Figure 6 shows the embedding of an EC with ownership of electrical facilities into the *LINK*-Architecture. HV, MV, LV, and CP_Grid-Links are arranged throughout the Smart Grids. Storage- and Producer-Links are connected to all Grid-Links through technical interfaces "T". The electricity market surrounds the whole technical/functional architecture. It enables all stakeholders to participate in a non-discriminatory way through market interfaces "M". All grid operators, both TSO and DSO, indicated by orange interfaces in the figure, coordinate the market to guarantee a reliable and secure functioning of the own Grid-Links.

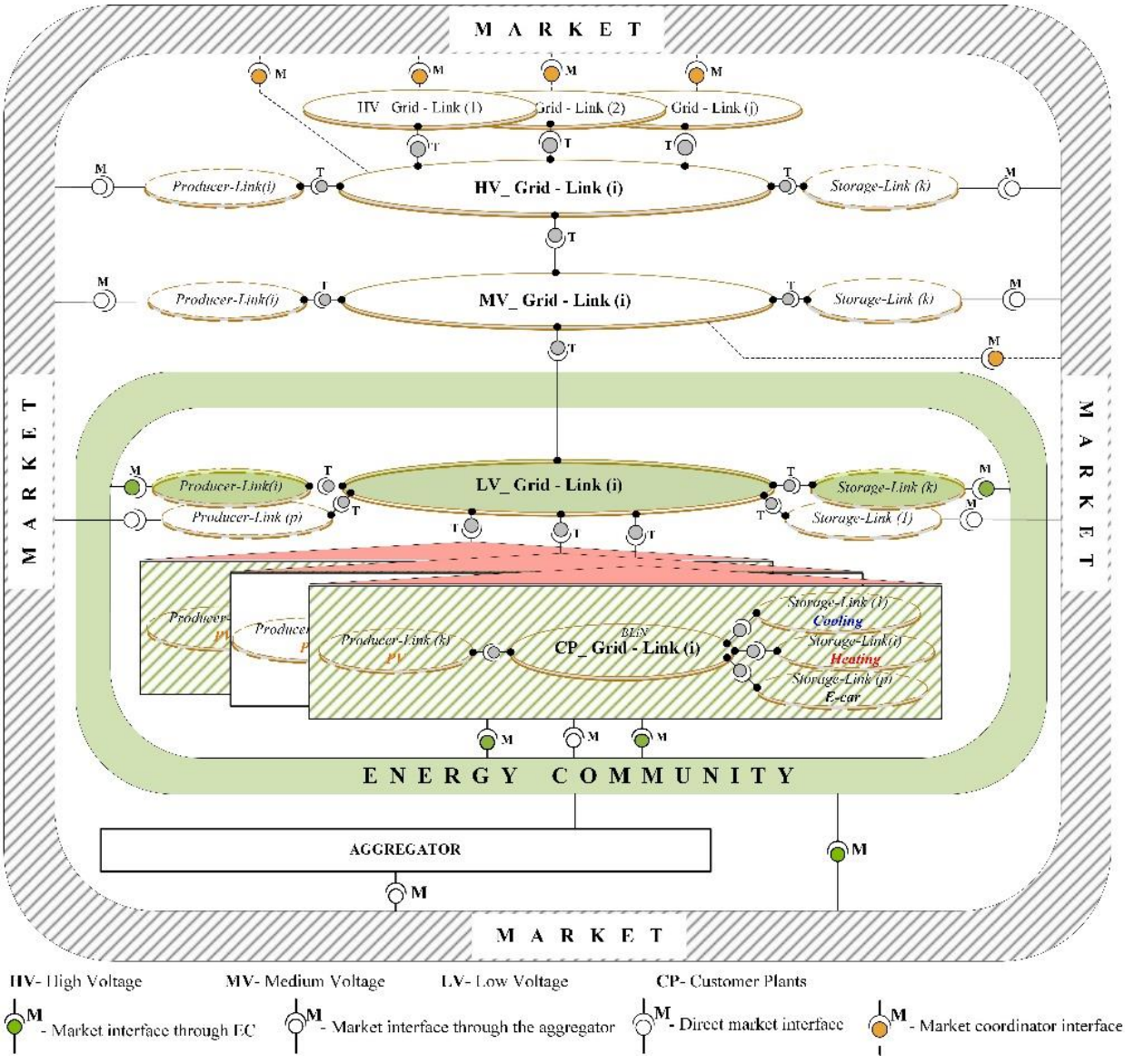

Figure 6: EC with ownership on electrical facilities embedded in the *LINK*-Architecture.

The EC organization, marked green, surrounds all electrical facilities of its participants. EC owns and operates the LV_Grid-Link, Producer- and Storage-Links. Prosumers participating in the EC are characterized by a dashed area. They act as black boxes to the EC, disclosing only the difference between their production and consumption. Thus, the data privacy of each customer is guaranteed. A local electricity market can be established where the participants are all EC members or shareholders, trading electricity and services with each other and with members of different markets. The EC energy surplus or deficit can be traded throughout the market, with each EC acting as a retailer.

Each market actor, i.e., consumers, prosumers, DER operators' service providers that do not participate in the EC organization, can trade its electricity directly or through an aggregator to the wholesale market (transmission or distribution). Thus, all market actors, members, and EC members participate in the market in a non-discriminatory way. EC operates the LV_Grid-Link and coordinates the local electricity market by guaranteeing a reliable, economical, and secure electricity supply. EC is responsible for the local long-term supply and storage planning and corresponding coordination with the relevant DSO and neighbours (EC or Grid-Links) to guarantee a reliable power supply in its area. The whole EC area acts as a black box opposite the neighboring Grid-Links. EC should exchange the required information and coordinate the operation (ancillary services provision) with neighboring Grid-Links.

3.4.2 EC without ownership on electrical facilities

Figure 7 shows the embedment of an EC without ownership of electrical facilities in the *LINK*-Architecture. Like the case above, a local electricity market can be established where all participants are EC members. There, they can trade electricity with each other. Special coordination with the LV_Grid-Link operator is required to keep the power supply quality such as voltage and not overload the grid. In this case, a mechanism for leasing a grid part may be necessary.

The real-time schedules will be generated by the EC-local market and coordinated by the operators of the neighbouring Grid-Links. The LV_Grid-Link operator (DSO) will check the technical feasibility of the schedules and approve or reject them. EC may take over responsibilities for the local long-term supply and storage planning and the corresponding coordination with the neighbouring Grid-Links to guarantee the power supply in its area. Using Secondary Controls (on active and reactive power) of *LINK*-Solution, DSOs have the technical possibility to comply with the proposed schedules ECs by coordinating the operation with the relevant TSOs (also in terms of ancillary services provision).

The main impact of EC is on distribution systems, both in planning and operation, while the impact on transmission level is indirect. If spread above a certain amount of penetration level ECs may modify the amount and directions of power flows and the daily/seasonal load patterns. Moreover, the EC may affect (positively, if properly managed) the way ancillary services are provided to TSOs and traded and valorised through market mechanisms. They can also offer flexibility-related services to the DSO, facilitating energy transition strategies

associated with increasing renewable energy hosting capacity and promoting the deployment of electric vehicles while minimising the grid expansion investments.

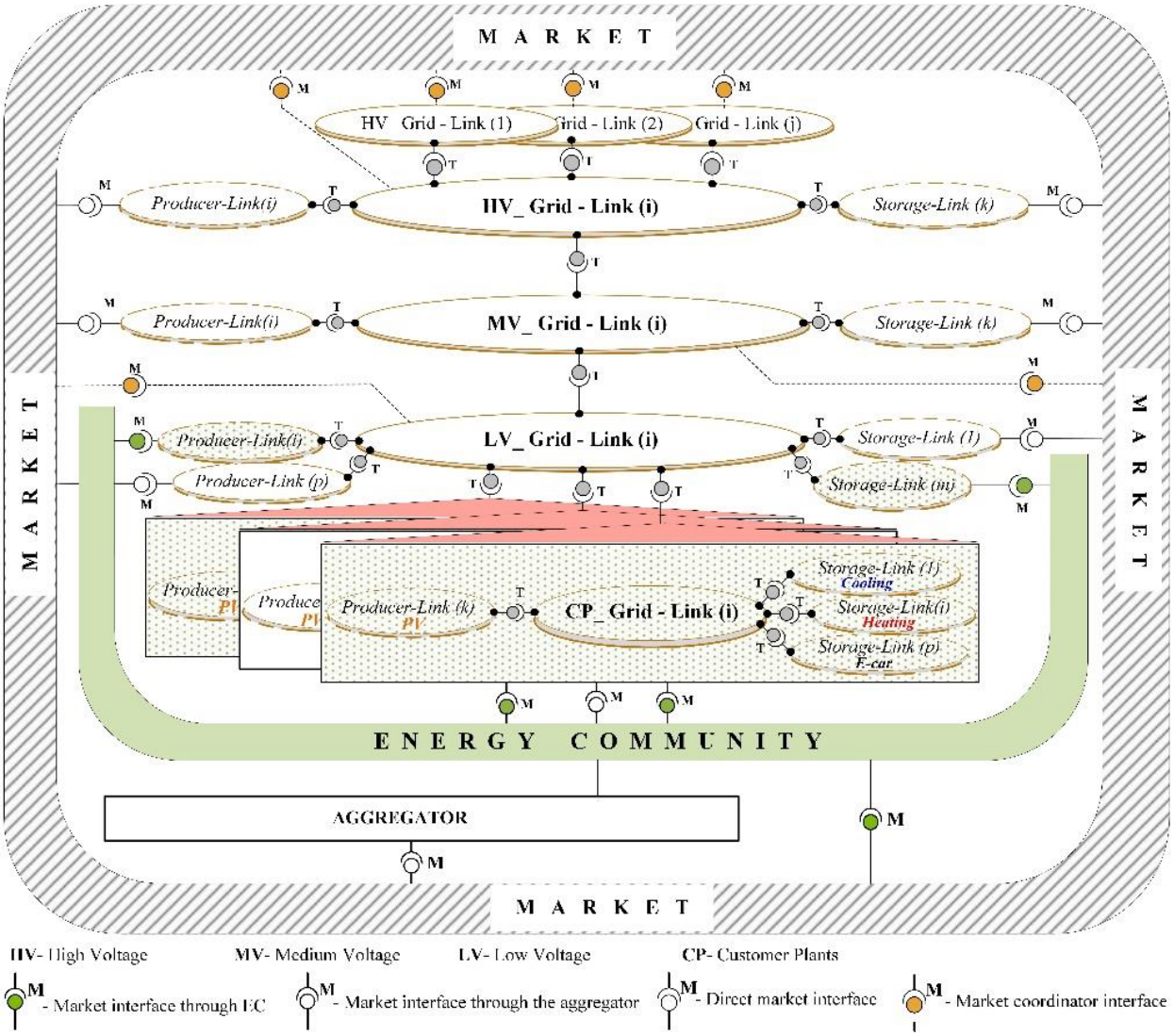

Figure 7: EC without ownership on electrical facilities embedded in the *LINK*-Architecture.

3.5 Roles

The role is related to the function or position the actor has or is expected to have in an organization, society, or a relationship. In the case of INTERACT EC, it is essential to distinguish between the role of INTERACT EC to other energy sector actors, the role it will play within the energy community, and the members' roles.

3.5.1 INTERACT EC roles to other energy sector actors

INTERACT EC can interact with many actors or stakeholders in the energy sector, Figure 8., They are DSOs (as a technical operator or wholesale market "Distribution" operator), authorities, and regulators. It can also interact with electricity producers and storage

operators, vehicle charging operators, and customers (prosumers and consumers) that are not EC members. While Table 8 gives a more specific overview of their roles.

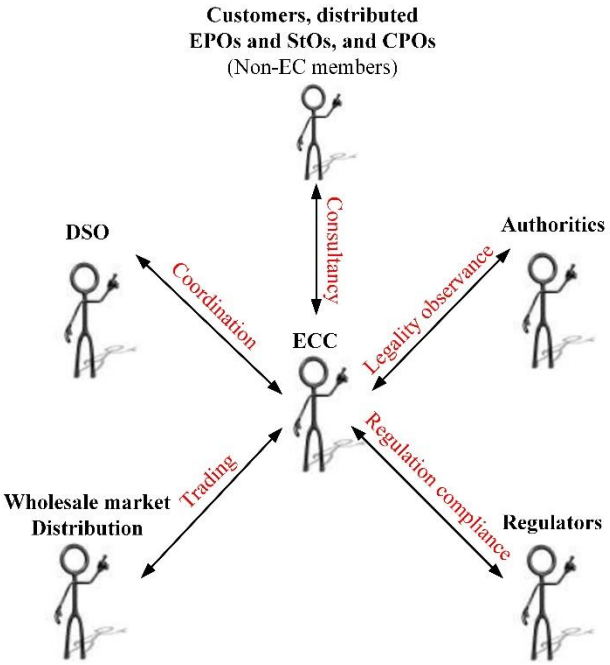

Figure 8: Overview of the INTERACT EC roles to other energy sector actors

Table 15: Actors and roles of INTERACT-ECs to other energy sectors actors

Actors		INTERACT-EC Roles
DSO	**Technical operator**	Coordination with the relevant DSO to: • Enable a reliable and secure grid operation in normal and not normal conditions; • Facilitate the recovering process after a blackout.
	Operator of the wholesale market "Distribution"	• Trade between the wholesale market "Distribution" and the local market established and handled by the EC.
Non-EC members	**Customers**	• Member's recruitment and consulting concerning necessary technology upgrades.
	EPOs	• Member's recruitment and consulting concerning necessary technology upgrades.
	StOs	• Member's recruitment and consulting concerning necessary technology upgrades.
	CPOs	• Member's recruitment and consulting concerning necessary technology upgrades.
Authorities		• Cooperation with local, regional, national and EU authorities for a smooth development of the EC.
Regulators		• Close cooperation to guarantee compliance by all local market participants with competition rules.

3.5.2 INTERACT EC role to its members

INTERACT EC interacts with its members such as EPOs, CPOs, StOs, customers be consumers or prosumers and DSOs. Its roles to the members are diverse. It coordinates the energy and flexibilities trading in the local market, the long-term planning of facilities, the day-ahead and short-term operation planning, and all legally and organizationally required issues. Additionally, it cares about the members' concerns, brings them together, promotes the knowledge share, etc., Table 16.

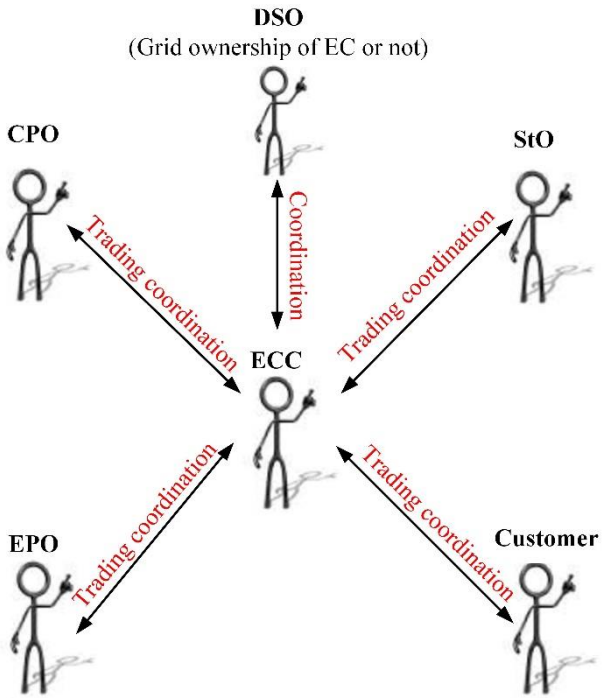

Figure 9: Overview of the INTERACT EC roles to its members

Table 16: Roles and functions of the INTERACT-ECs to its members

Actors	INTERACT-EC Roles
EPOs	- Coordination of: • Energy and flexibilities trading in the local market; • Long-term planning of facilities; • Day-ahead and short-term operation planning; • All legally and organizationally required issues. - Caring about EPOs concerns; - Bringing members together; - Promotion of knowledge exchange; - Providing consulting services; - Responsible for accounting and billing related to EC activities.
StOs	- Coordination of: • Energy and flexibilities trading in the local market; • Long-term planning; • Day-ahead and short-term operation planning;

	• All legally and organizationally required issues. - Caring about StOs concerns; - Bringing members together; - Promotion of knowledge exchange; - Providing consulting services; - Responsible for accounting and billing related to EC activities.
CPOs	- Coordination of: • Energy and flexibilities trading in the local market; • Long-term planning; • Day-ahead and short-term operation planning; • All legally and organizationally required issues. - Caring about CPOs concerns; - Bringing members together; - Promotion of knowledge exchange; - Providing consulting services; - Responsible for accounting and billing related to EC activities.
Customer (consumer and prosumer)	- Coordination of: • Energy and flexibilities trading in the local market; • Long-term planning; • Day-ahead and short-term operation planning; • All legally and organizationally required issues. - Caring about customers (prosumers and consumers) concerns; - Bringing members together; - Promotion of knowledge exchange; - Providing consulting services; - Responsible for accounting and billing related to EC activities.
DSO* * Grid owned by EC or not	- Coordination of: • Energy and flexibilities trading in the local market; • Long-term planning; • Day-ahead and short-term operation planning; • All legally and organizationally required issues. - Caring about grid concerns; - Bringing members together; - Promotion of knowledge exchange; - Providing consulting services; - Responsible for accounting and billing related to EC activities. Sharing the relevant data for the local electricity market.

3.5.3 INTERACT EC members role

Table 17: Roles and functions of the INTERACT-EC members

Actors	INTERACT-EC members roles
EPOs	• Operation and maintenance of Producer-Links. • Sharing the relevant data for the local electricity market and the corresponding Grid-Link operation.

StOs	• Operation and maintenance of Storage-Links. • Sharing the relevant data for the local electricity market and the corresponding Grid-Link operation.
CPOs	• Operation and maintenance of the vehicle charging station. • Sharing the relevant data for the local electricity market and the corresponding Grid-Link operation.
Customer (Consumer and prosumer)	• Sharing the relevant data for the local electricity market and corresponding Grid-Link operation.
DSO* * Grid owned by EC or not	• Operation and maintenance of the grid. • Sharing the relevant data for the local electricity market.

3.6 Value creation and sharing

3.6.1 Value creation

In general, the INTERACT EC may create all the values described in Table 18.

Table 18: Values created by INTERACT ECs

Category	Value	Description
Economical	Cost reduction	Local energy usage reduces the power transfer through the grid and thus the corresponding system usage charges. The electricity price may be lower at the local market.
	Revenue generation	Sell of electrical energy and ancillary services generates revenues. Tax revenues generate income for the municipality.
	Job creation	Employees are necessary for the administration of the EC and the installation, operation and maintenance of the technical systems.
	Stimulation of the local economy	The use of local resources and the generation of local income stimulate the local economy.
Environmental	Reduced CO_2 emissions	The increased share of renewables within the community and the increased efficiency of the overall power system reduces the global CO_2 emissions.
	Improved infrastructure utilization	Local energy usage reduces the need for transmission and distribution infrastructure. Innovative control schemes increase the utilization of the community grid.
Social	Energy independence / autonomy	The community is less dependent on big generation companies.
	Social cohesion	Energy communities may strengthen the social cohesion by promoting community building, social inclusion, and the development of a collective community identity.
	Education	Energy communities may improve citizens' understanding of the energy system and increase their awareness for energy-related issues. Ultimately, members may shift to a more sustainable lifestyle.

		Increased acceptance of EC members for new installations (such as community-owned PV and WT systems).
	Energy access	ECs generally aim to provide benefits for the local community rather than maximizing profits. Therefore, they are in a better position to combat energy poverty than traditional utilities.
	Energy democracy	ECs promote energy democracy by involving citizens in decision-making and creating social and environmental benefits.
	Security of supply	ECs can enhance security of electricity supply at the local level.
	Self-determination	The community members are involved in the decision-making process, thus having a higher degree of self-determination compared to a centralized energy system.

3.6.2 Value sharing

All sharing schemes for financial values that ensure the stability of the INTERACT EC may be used. Possible sharing schemes are overviewed in section 2.1.4.2.

4 Specific structures of the INTERACT energy communities in the pilot regions

The specific structures of the INTERACT ECs in both pilot regions are derived from the generalized one described in section 3 using the results of the questionnaires described in section 2.2.

4.1 Großschönau

4.1.1 Activities

Table 19 lists the activities of the INTERACT EC in the Austrian pilot site Großschönau.

Table 19: Activities of the INTERACT-EC in Großschönau

Activity	Description
Market operation	Non-discriminatory operation of local electricity (energy and ancillary services) markets in harmony with the grid and other markets.
Producer operation	Operation and maintenance of Producer-Links connected at the LV level.
Storage operation	Operation and maintenance of Storage-Links connected at the LV level.
Planning of facilities	Long-term planning of EC-owned producer and storage facilities.
Consultancy	Advice members, customers, EPOs, and ESOs concerning necessary technology upgrades.
Community building	Caretaking, bringing members together, promote knowledge exchange between members, information sharing, enlarging the community, etc.
Energy sale	The produced or stored electricity is fed into the grid and sold to a supplier.
Self-consumption	The produced or stored electricity is consumed within the community.
Supply	Electrical energy is sold to customers.
Aggregation	Aggregate customers to enable their participation in the market.
Ancillary services	Provision of ancillary services to support the grid operation.
E-mobility	Management of charging stations.
Administration, Accounting and billing	All legally and organizationally required work in order to run the EC: bookkeeping, membership administration, tax reporting, other reporting duties to owners, members and authorities, etc.

4.1.2 Stakeholders

The stakeholder groups relevant for the EC in Großschöanu are listed in Table 7 in section 2.2.1.1. A detailed analysis of their structure and motivations can be found within Deliverable 2.2 - Stakeholder Analysis.

4.1.3 Community ownership

4.1.3.1 Community-owned assets

Table 20 lists the assets owned by the members of the INTERACT-EC or the INTERACT-EC itself in Großschönau.

Table 20: Assets owned by the INTERACT-EC and/or its members in Großschönau

Asset	Description
Producers	Producers of electricity, mainly PV stations.
Storages	Storages of electricity (mainly EV chargers and batteries)
Land	A piece of land which may be used for community-owned installations (e.g., PV plants or stationary battery storage) and buildings (e.g., office buildings).
Buildings	Offices for the administration and management of the EC.
ICT Infrastructure	The necessary ICT infrastructure to operate the INTERACT-EC
Intellectual Property	Patents, Designs, and/or Brand Rights.

4.1.3.2 Legal ownership form

Based on the feedback of the stakeholders, the INTERACT-EC in Großschönau shall be organized as a new corporation or addition of an existing corporation.

4.1.4 Responsibilities

Table 21 allocates the roles described in section 3.5 to the stakeholders in Großschönau.

Table 21: Allocation of roles to stakeholders in Großschönau

Stakeholder	Role
Municipality	Initiator of the INTERACT-EC; Member of the INTERACT-EC
Municipal organizations and facilities	Member of the INTERACT-EC
Opinion leader organizations	Potential Member of the INTERACT-EC, PR & Marketing, Information Sharing
Private Businesses	Potential Member of the INTERACT-EC
Infrastructure provider	Business Partner of the INTERACT-EC, connected via technical interfaces and market interfaces
Local associations	Potential Member of the INTERACT-EC, PR & Marketing, Information Sharing
Citizens	Potential Member of the INTERACT-EC

4.1.5 Value creation

The INTERACT EC in Großschönau will create all values described in Table 18.

4.2 Fyllinge

4.2.1 Activities

Table 22 lists the activities of the INTERACT EC in the Swedish pilot region Fyllinge.

Table 22: Activities of the INTERACT-EC in Fyllinge

Activity	Description
Market operation	Non-discriminatory operation of local electricity (energy and ancillary services) markets in harmony with the grid.
Accounting and billing	Accounting and billing the energy consumption/production and the ancillary service provision of each member.
Producer operation	Operation and maintenance of Producer-Links connected at the LV level.
Storage operation	Operation and maintenance of Storage-Links connected at the LV level.
Planning of facilities	Long-term planning of EC-owned producer and storage facilities.
Consultancy	Advice customers, EPOs, and ESOs concerning necessary technology upgrades.
Community building	Caretaking, bringing members together, promote knowledge exchange between members, etc.

4.2.2 Stakeholders

The relevant stakeholders in Fyllinge are the real estate developer, DSO, municipality and the citizens that will live in the area.

4.2.3 Community ownership

4.2.3.1 Community-owned assets

The INTERACT EC in Fyllinge shall own the assets listed in Table 23.

Table 23: Assets owned by the INTERACT-EC in Fyllinge

Asset	Description
ICT infrastructure	Communication infrastructure (e.g., fiber optic cables) and information technologies (e.g., servers).
Producers	Producers of electricity.
Storages	Storages of electricity.
Land	A piece of land which may be used for community-owned installations (e.g., PV plants or stationary battery storage) and buildings (e.g., office buildings).
Buildings	Offices for the administration and management of the EC.
Intellectual Property	Patents, Designs, and/or Brand Rights.

4.2.3.2 Legal ownership form

Based on the proposed legislation, the EC in Fylling will likely be organized as an economic association

4.2.4 Table 23Responsibilities

Table 24 allocates the roles described in section 3.5 to the stakeholders in Fyllinge.

Table 24: Allocation of roles to stakeholders in Fyllinge

Stakeholder	Role
Real estate developer	Energy community chairman or -woman
DSO	Grid Operator
Municipality	
Citizens	Potential Member of the INTERACT-EC Customer

4.2.5 Value creation

The INTERACT EC in Fyllinge will create all values described in Table 188.

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