European Commission

SMART RURAL 21

PREPARATORY ACTION ON
Smart Rural Areas in the 21st Century

STANZ IM MÜRZTAL

Stanz Token

Examining opportunities to combine a digital local currency with a renewable energy community in Stanz im Mürztal.

Final Version

Agentur SCAN
Caliber Consult GmbH
ABC Research GmbH

Stanz im Mürztal / Vienna

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Contacts:
Agentur SCAN e.U. office@scan.co.at
Caliber Consult GmbH hello@caliberco.at
ABC Research GmbH office@abc-research.at

Authors in alphabetical order: Alexander Baldele, Mirella Bärnthaler, Rainer Rosegger, Lisa Schatz, Lukas Sparer, Vinzenz Treytl.

Executive Summary

Stanz, a rural Austrian community, was selected to participate in the Smart Rural 21 Project of the European Commission. This allowed the project team to examine the specific case of the use of new technologies for the implementation of a renewable energy community and as a result, the further economic use of decentralized and autonomous systems based on blockchain technology.

To strengthen the community's resilience and autonomy one of several projects in Stanz im Mürztal focuses on the exploitation of local renewable energy resources. As a consequence Stanz has committed itself to the foundation of a renewable energy community, according to article 22 RED II 2018 of the European Union. The implementation process, starting in 2021, has followed the local policy to combine technical and social innovation in order to secure effective results and sustainable development within the community.

During the project and as part of the sociological field study/participation process, an information event, six facilitated working group meetings, qualitative interviews, and a two-day conference were held in the course of the project. It became apparent that there was a great interest in the topics of local energy transition as well as a local voucher system, which was seen as a local currency by the participants of the participation process. The feasibility analysis of the projected token economic system picked up the insights of the sociological project phase dealing with the scientific evaluation of the needs and expectations of stakeholder groups. The economic analysis included the sociological results into the system design of a future token economy. The token engineering study considered the legal, technical, economic and ethical aspects in order to create a merger of both the energy and voucher systems. The research paper hereby concentrates on the possible roles of both, the renewable energy community as an issuer of a utility token based on energy production and the municipality of Stanz as an issuer of a local voucher system to stimulate the local economy. The evaluation based on this includes recommendations on to what extent the implementation of a blockchain-based decentralized management and the creation of a token based economic system are a viable solution for a local rural community. As a consequence, the research paper states that a merger will not guarantee the expected advantages and cause complications which can be avoided if the systems are kept apart in regard to the present requirements.

In conclusion the project team recommends to focus on the implementation of a token based management of the energy supply within the renewable energy community, with the gradual expansion of energy based applications within the municipality. The municipality however should keep the voucher system as an effective tool to strengthen the local economy and create further services based on vouchers.

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1. Introduction & Project Context

1.1. About Stanz im Mürztal

Stanz im Mürztal is located in a rural area in the Austrian province of Styria with a total population of 1,855 inhabitants, in a side valley of Mürztal. The region is industrial and has been affected by economic structural change in recent decades, which is one of the reasons for strong depopulation and aging of the population. The small-scale economy of the village is reflected in the high percentage of residents who commute to work in neighboring areas.

In the 2015 municipal elections, an impartial list of citizens became the strongest force in the municipal council and has held the office of the mayor ever since. Facing given challenges and planning structural changes at the administrative level, Stanz decided to take new paths in community building. This was followed by a consistent, strategically oriented municipal development with a focus on strengthening the local center, activating civil society and creating opportunities for participation at the municipal level. Building on the successes of recent years, the municipality as well as the community of Stanz are committed to the municipal energy transition. Social innovation is thereby a priority and provides the basis for the "Stanzer Weg" towards becoming a "Smart Village" model project at national level.

1.2. Preliminary work and ongoing projects in Stanz

The impulse and lighthouse project for the innovative municipal energy turnaround with strong participation of the population is “Stanz+: An innovative, energy-flexible plus-energy quarter - the village center of the municipality of Stanz”. The project started in 2020 and will be completed in 2023. Within the framework of the project funded by the FFG (Austrian Research Promotion Agency) with a total sum of around 700,000 Euro, the focus is on creating “a best practice” for an innovative plus energy district in a smaller community that offers multipliable solutions for communities with similar challenges at national and international level”[1]. The project period is from 2020 to 2023. The expected results are[2]:

- Establishment of a new biomass district heating and electricity network in the center of Stanz also in terms of more energy flexibility. Integration of water and wind power and their excess electricity in the energy supply, targeted installation of photovoltaics on roof areas to increase the proportion of solar energy in the community.

- Innovative energy renovation of a building in the village center for public use: Providing new space on a sunny slope centrally next to the village square, contrary

[1] https://projekte.ffg.at/projekt/3793879, last accessed on 12. 6. 2022
[2] ibid

to the trend to seal good agricultural soils in valley locations, targeted re-densification and renovation in the center of the community.

- Development and implementation of new tariff structures for energy use and financing concepts for existing and new buildings as well as infrastructure in the central area of the municipality of Stanz, with the aim of a 50% reduction in CO2-emissions of the building stock.

- Implementation of new models for energy generation, distribution and use as innovative examples for structurally weak communities: Participation and financing models (local energy community, citizen participation) for new products and services - "Rural Pioneers Community".[3]

It was already known at the time of project submission in 2019 that Austria would have to implement Article 22 - Renewable energy communities, Renewable Energy Directive – RED II 2018 into national legislation. Therefore, one focus of the project is on "Rural Pioneers Communities" in the field of energy and the preparation for the creation of a Renewable Energy Community (hereafter: REC) in Stanz. In the process of dealing with this topic, the idea emerged to link decentralized energy production and consumption with economic cycles at the local level and by this means strengthen the location.

A successful outcome as a social innovation is thus the establishment of the REC "EG-Stanzertal" in accordance with the Renewable Energy Expansion Act 2021 (hereinafter: EAG). With this legislation, Austria is one of the most ambitious countries in Europe in the national implementation of the RED II 2018. The REC was founded as an association in February 2022 and now counts 60 members (as of June 2022). At the moment, preparations are ongoing for the start of energy trading within the community. This is where the project "Stanz Token" comes in.

[3] https://projekte.ffg.at/projekt/3793879, last accessed on 12. 6. 2022

2. Methodological Approach

In order to empirically test the feasibility of the idea of connecting the REC Stanzertal with a token economy for the introduction of a local digital currency (DLC) in Stanz im Mürztal, social science research was combined with a participation and co-creation process. The results of this process were integrated into the token engineering process, which includes legal, economic, technical and ethical considerations.
Thus the research question resulting from the prerequisites in chapter 1 reads as follows:

What preconditions are necessary to create a digital local currency for the community of Stanz which is based on an energy token issued by the REC Stanzertal?

2.1. Methodology of Field Research and Participation Process

Methodologically, desktop research, problem-centered interviews and focus group discussions were conducted, as well as an open space conference with experts and stakeholders. The approach was based on "grounded theory". This research method is characterized by process openness and process orientation. Since technical, economic and social science disciplines worked together in the limited time frame of the present project, this openness to processes enabled a joint transdisciplinary development of knowledge. Using grounded theory, collected data is constantly systematized in accordance with the research question and elaborated categories, and reflected upon with regard to the insights gained. Data collection and data evaluation thus do not take place at different times but proceed in parallel within the participation process duration of the project. Generally speaking, the researchers continue to collect new data and information until the results are "grounded". This means that additional data collection does not lead to any further fundamental gain in knowledge.[4] There is also no classic sample for which data collection is carried out. The selection of persons for the research process follows the method of "theoretical sampling": deliberate consideration is given to whom to interview or from which group to select participants for the study. This requires a certain methodological sensitivity and experience on the part of the researchers. Participants are selected in such a way that as much different information as possible can be collected on the object of the research. Decisions are made on the basis of the insights gained as to who will be involved in the survey next in order to perhaps answer new questions or substantiate insights already gained and, as mentioned above, one stops involving new people when a certain saturation

[4] cf. Muckl et. al. (2017)

of information has been reached.[5] The following research questions were formulated as part of the field research and participation process:

- "How do relevant population groups in Stanz assess the introduction of a local digital currency based on blockchain technology?
- What functions should such a currency fulfill?
- Where and for what purposes would such a local currency be used?"

The following stakeholder groups were selected for the study and participation process:

- Members of the REC Stanzertal: producers, prosumers, consumers
- Volunteers and honorary members of the community
- Representatives of businesses, municipality and relevant institutions

Within the framework of the field research, the aim was to conduct six qualitative interviews, to execute six focus group discussions in the form of workshops and to organize an open space conference. As mentioned at the beginning, this research strategy is suitable to simultaneously function as a participation format in the sense of co-creation. As Stanz is a small community where people know each other personally and this is a highly innovative and experimental research and participation topic, it was tried to inform as comprehensively and sensitively as possible in order to avoid rumors or false flows of information.
Regarding the quality of empirical research processes, objectivity, reliability and validity are seen as criteria for the researchers in order to be able to create valid statements. These are difficult to transfer to qualitative research processes. Steineke (2008) therefore proposes four core criteria for the quality of qualitative social science strategies[6]:

- **Indication of the research process:** Refers to the appropriateness of the methodological approach with regard to the given research question.
- **Empirical anchoring:** Verifiability should be ensured that results are based on empirically collected data.
- **Generalisability or limitation:** Results should be transferable to other comparable situations.
- **Intersubjective traceability:** This requires comprehensive documentation of the research process with the methods used.

The investigation of individual opinions, estimations and desired implementations is a matter of subjective statements. In social science research care must be taken to ensure that not individual opinions are represented, but rather that there is a transferable relevance and

[5] cf. Muckl et. al. (2017)
[6] Wassong (2017)

representativeness within the groups studied. This is ensured with the quality criteria outlined here and the approach of the "grounded theory" described above and the complete recording of the processes carried out in the form of protocols. At the same time, it must be underlined that these collected facts cannot be equated with a technical or legal feasibility, but are subjective wishes, opinions and suggestions from the community. Rather, they represent starting points and a framework for the discovery phase of the token engineering process.

For integration into the local context, a thematic and organizational coordination with the founding process of the REC Stanzertal, the Energy Agency Styria, which accompanies the implementation of RECs in Styria in the current pilot phase, and the FFG Stanz+ project "Creation of a plus energy quarter" was important and relevant. Through the Stanz+ project, contact was established with the Horizon project DECIDE "Developing energy communities through informative and collective actions"[7], where an in-depth exchange on the level of science and practical experience was possible. Furthermore, contact was made with the project "EC2: Harnessing knowledge for a citizen-led energy transition"[8].

2.2. Token Engineering

The process of designing token-economic systems is referred to as token engineering. Token engineering needs to consider various aspects as well as the interest of all stakeholders involved in the system. While blockchains are per se technical artifacts, the token engineering process is a holistic process which combines not only technical engineering but also economic, legal and ethical perspectives.[9]

The focus of economic engineering lies in the creation of mechanisms and rules that steer individual users as well as collective action. This is normally done by incentivizing users for certain behavior with tokens. Needless to say, any mechanism designed needs to be legally compliant. Legal engineering is concerned with defining rules for governing the system. Together with ethical considerations, these form the basis for a subsequent technical implementation.[10]

A general methodology for analyzing projects from the perspective of crypto-economics consists of an interactive approach that can be broadly described in three phases: discovery, design, deployment.[11]

During the **discovery phase** a general understanding of the ecosystem and its stakeholders, the economic mechanisms and value flows is established. The goal is to get a

[7] see: https://decide4energy.eu
[8] see: https://ec2project.eu
[9] Voshmgir (2020)
[10] Voshmgir (2020)
[11] cf. Outlier Ventures (2018)

clear picture of the envisaged functioning of the system so that incentives of all stakeholders can be aligned to the ecosystem's mission.
The **design phase** focuses on the formal specification of the economy and the translation of the business requirements into mathematical language. Both analytical and simulation modeling approaches can be used to reinforce each other. The mutual influence of these techniques can enrich the modeling process and increase validity.
Finally, during the **deployment phase** simulation experiments are conducted and the model is validated with live system operational data. The results provide recommendations on mechanism design, parameter selection and policy choices for the governance and maintenance of the system.
The Stanz token project focused on the discovery phase. Based on the main research question of the project, the following research question was specified for the token engineering phase of the project:

- Is the creation of a digital local currency for the community of Stanz which is based on an energy token issued by the REC Stanzertal **feasible and advisable**?

Several methodologies were applied in accordance with the participation process strategy to understand the constraints and requirements of the use case. This contained extensive literature research, interviews with experts and key players in the Stanz as well as an extensive field research phase with the active participation of the Stanz population (see above 2.1.).
As a result, the token engineering team developed a basic understanding of the overall systems involved. Key stakeholders involved in the project were analyzed further and grouped into agent roles with similar incentives, ambitions, goals and preferences. This allows the design team to understand the motivational structure behind economic value transfers within the system's borders and to identify how values of individual actors can be aligned to the mission of the ecosystem.
This information forms an important basis for further design and simulation work in subsequent projects. The ultimate goal of this discovery phase is to systematize the knowledge about the planned ecosystem in order to enable a formal specification of the system in subsequent phases.

3. Blockchains, Tokens and Token Economic-Systems

3.1. An Introduction to Blockchain

A blockchain is a special form of distributed database ("distributed ledger") that is shared over a computer network such as the Internet. Each computer node in the network may contain a copy of the ledger. The participating nodes communicate without a central server in the form of a "peer-to-peer" network. By using cryptographic processes based on digital signatures and hash algorithms, blockchains allow the creation of a trustworthy decentralized database in which data can be transparently stored in a way that is immutable for potential attackers. A consensus process is used to ensure that all nodes have the same view of the data and that a consistent state is achieved.

The advantages of using blockchains (or DLTs in general) lie primarily in decentralization, which enables software architectures without a central server or a trusted third party. The use of blockchain technology can ensure the collaboration of numerous independent actors who do not fully trust each other. The decentralized approach also ensures automatic data replication, whereas the consensus mechanism provides a consistent view of the shared state by each participant. This guarantees the resilience of the system, so that even if individual nodes fail, the blockchain as a whole continues to function (no single point of failure).

Probably the most important argument for using blockchain technology is the maximum transparency and traceability of transactions. Originators, times and contents of all transactions as well as their sequence are clearly visible to all parties involved. When using a permissioned blockchain, companies can decide for themselves which data should be shared with which other partners.

In summary, Blockchain and other Distributed Ledger Technologies (DLT) are a database-technology that allows for the secured and tamper-proof recording of transactions by a permissionless peer-to-peer network. Due to their properties such as immutability of transactions and transparency, blockchains can be used to create a unified data layer for all participants of a system. Most importantly, this enables the creation, storage and transfer not only of information but also of value.

There are currently well over 1,000 different blockchains, as well as related technologies, generally referred to by the term "distributed ledger technology" (DLT). The underlying protocols of these systems can vary widely. Since the launch of the Bitcoin blockchain[12] several alternatives have been proposed that improve certain aspects of the technology. For example, Ethereum has introduced so-called "smart contracts"[13], which are decentralized

[12] Nakamoto (2008)
[13] Buterin (2013)

computer programs that can automatically make changes to the blockchain in response to certain events, helping to bring business logic on-chain and automate business processes.
An interesting extension of the Blockchain concept consists of the possibility to create so-called tokens. Tokens are digital assets i.e. purely digital objects with certain rights attached to them. For example, the Ethereum protocol defines standardized token contracts (e.g. ERC-20 and ERC-721) that can be used as a basis for token-based applications[14]. Tokens can be generated and exchanged by smart contracts. Depending on the rights attached to a token, several types of tokens can be distinguished. So-called utility tokens can be used to access services provided by a blockchain ecosystem. Security Tokens represent the ownership of a digital or physical asset. So-called payment tokens – as the name implies – represent a form of value that can be used for the purchase of goods and services.) For a more detailed discussion see chapter 3.4. on regulatory considerations (below).

Blockchains and Energy Waste

One common misunderstanding about Blockchain is that the operation of a blockchains requires vast amounts of energy to operate[15]. However, blockchains have to be understood as a technology family rather than a single technology. There are numerous Blockchain protocols with different characteristics. While it is true that some of these protocols (e.g. Bitcoin) rely on energy-extensive processes to ensure system security, this is not true for the Blockchain technology family as a whole.
Having identified energy waste as a major drawback of older protocols, newer protocols (e.g. Tezos, Cardano, Avalanche or Solana) use improved processes such as proof-of-stake consensus mechanisms that dramatically reduce energy consumption per transaction[16].
For example, while the operation of the Bitcoin protocol is estimated at more than 100 TWh per year, the operation of the Tezos protocol is estimated to use only 0,1GWh per year[17].

[14] see https://ethereum.org/en/developers/docs/standards/tokens/erc-20/ and https://ethereum.org/en/developers/docs/standards/tokens/erc-721/
[15] CCRI 2022b, Statista 2022
[16] CCRI 2022a, CCRI 2022b, Cryptoadvantage.com 2022
[17] CCRI 2022a, Cryptoadvantage.com 2022

3.2. Token Economic Systems

The application of blockchain technology in specific projects can happen in a variety of ways. One particularly interesting perspective enabled by blockchain technology is the introduction of so-called token-economic systems which are centered around cryptographic tokens. Tonnissen; Beinke & Teuteberg (2020) define "a token-based ecosystem [as] the alignment structure of a multilateral set of partners for a defined period of time who, through the active shaping of relationships, pursue a common goal of creating common added value for all actors through a central value proposition with tokens as the value proposition of the ecosystem."[18] Token-based ecosystems can be understood as a network of relationships within a community that is supported by blockchain-based infrastructure in order to create and distribute value.

Tokens are central for such a system, as they are used as a unit of value in order to distribute benefits for contributing users and in turn enable these users to access products and services provided by the ecosystem. Within the ecosystems tokens can be thought of as the "digital currency" of this ecosystem.[19] As such tokens can be used for transferring value between business partners as a unit of account or as a store of wealth. Additionally, as tokens can also be flexibly designed, they can help to incentive people to use a specific service managed via the blockchain[20] or achieve network effects for the community and the ecosystem.[21]

3.3. Examples

There are numerous examples of token economic systems being implemented for a wide variety of use cases. The following examples try to give an impression of the bandwidth in which these systems have been implemented.

Wiener Kultur Token: The non-profit Kultur-Token is a project that fosters environmentally friendly and sustainable mobility behavior. The app which is sponsored by the City of Vienna mainly pursues non-financial goals that contribute to the achievement of the UN Sustainable Development Goals.[22] The app rewards citizens and encourages low-carbon modes of transportation by incentivizing users with tokens that can be used to access local museums and other cultural venues. The mobility behavior of users is automatically tracked. Currently

[18] Tonnissen; Beinke & Teuteberg (2020), p. 309
[19] Mougayar (2017)
[20] Pikington (2015), Conley (2017), Wenger (2016)
[21] Chen (2018)
[22] Foster, Lamura & Hackel (2020)

tracking of four modes of transportation is supported: car, bicycle/scooter, walking and public transport.
When users use an environmentally friendly mode of transportation (e.g. bicycle/scooter, walking or public transport), they are rewarded Kultur-Tokens that can be subsequently used at several cultural institutions like museums, concerts halls or theaters. The tokens earned as well as tickets bought for these tokens are stored as voucher tokens on a blockchain system. The system currently consists of three nodes and uses a so-called "Proof-of-Authority" mechanism.[23]

Basic Attention Token: The Basic Attention Token (BAT) is a blockchain-based advertising system. The system lets users earn tokens by viewing advertisements while they are surfing the internet. Furthermore, they have multiple options to specify which and how many ads they would like to see in a given time period. Generally, users receive about 70% of the advertising revenues generated by the system as a compensation for their attention. Users can then use these tokens to individually reward content creators (e.g. bloggers, news outlets) who they like.
The BAT is based on the common ERC-20-token standard and stored on a blockchain system. BAT is utilized within this ecosystem as a payment token allowing advertisers, users, and publishers to spend, earn and receive BATS. Users only require the Brave Browser as well as a wallet in order to participate in the system.[24]

Filecoin is a decentralized data storage network. It allows users with storage needs to redundantly store data. Users with excess storage can sell their excess storage. Users pay these storage providers in Filecoin's native token to store and distribute the encrypted data on the network.[25]

3.4. Regulatory Considerations for Tokens

New types of legal questions arise in connection with blockchain applications. These legal questions are currently discussed in the scientific community and have not been finally evaluated. This section tries to give an overview of relevant legal topics and a preliminary and simplified evaluation of some relevant legal issues.[26]

Purpose and function of a token define the applicability of legal regulations. The technological flexibility of Blockchain leads to numerous design possibilities, some on the

[23] Foster, Lamura & Hackel (2020)
[24] brave.com (2022); messari.io (2022)
[25] filecoin.com (2022); messari.io (2022)
[26] For detailed explanation please see Appendix A

technical level of a system, some in direct use for consumers. Thus several regulatory fields may be relevant, ranging from consumer protection to strict regulatory measures in capital market and supervisory law.[27] Moreover, the classification of tokens has different approaches both in literature and international context.

The classification made by the Austrian Financial Markets Authority (FMA)[28] divides tokens into

- Security Tokens,
- Payment Tokens,
- Utility Tokens,
- Hybrid Tokens with individual characteristics from several token categories.

This legal classification serves as a guideline and the token types described throughout this paper refer to this classification.

Security Token represent claims to payments of a certain amount of money against the issuer, they are similar to traditional securities such as bonds or shares.[29]
Apart from pecuniary rights a security token can also cover administrative rights, such as voting and participation. A token classified as a security results in a large number of requirements under financial market law including the publishing of a prospectus or concession obligations to name a few.[30]

Payment Tokens represent a certain value and are not intended for any other use than to purchase goods and services. According to the FMA, the review and regulatory treatment of payment tokens depend on the individual use case and the specific structure of the token. The most important concessions for approval depend on the concrete usage of the token as a payment at third party acceptors and whether it can be purchased or exchanged for money. The relevant factor for the issuance of payment instruments is personalization.[31]
The FMA considers payment tokens as e-money on principle, applying the E-Money Act 2010 also to regulate the license of the issuing body.

Utility tokens are primarily used to provide the holder with a benefit in relation to a specific product or service[32], such as granting access to a digital platform, they can hold

[27] cf. Appendix A, Token based systems from a supervisory law perspective, [1]
[28] ibid [3]
[29] ibid [5]
[30] ibid [9] and [10]
[31] ibid [14]
[32] ibid [19]

participation rights in development of products and services, and will be issued as a reward for certain behavior or for the achievement of certain defined goals within the token system.

However, utility tokens are often hybrid tokens, fulfilling the function of payment or security tokens. That is, the purpose defines the regulatory categorization – which will vary depending on the designed purpose. However, the business model defines what specific purpose is assigned to the token. The hybrid token will be classified as payment token, if payment function is added as a function. In summary, a case-by-case analysis is always necessary to define whether financial market law is applicable. Furthermore, European regulations are also planned for utility tokens in the future.

Outlook at European level

Within the Digital finance package[33] of the EU Commission a new supervisory regime for so-called crypto assets, the Markets in Crypto-Assets Regulation (MiCA) was drafted. It is intended to create a consistent regulatory framework for issuers and service providers of crypto assets. A crypto asset is "*a digital representation of value or rights that can be electronically transferred and stored using distributed ledger technology or similar technology*".

In general, the MiCA-V provides for a threefold classification of crypto assets:

- Asset referenced tokens (ART)
- E-money tokens (EMT) and
- all other crypto tokens that are not tokens mentioned above (especially utility tokens).[34]

However, MiCA does not apply to security tokens, as these already fall under a different and stricter supervisory regime (including MiFID II, Prospectus Regulation).[35]

As of 6 June 2022 the MiCA is still at draft stage and will not enter into force before 2023.

[33] cf. Appendix A, Token based systems from a supervisory law perspective,[23]
[34] ibid [24-26]
[35] ibid [27]

4. Background

4.1. Energy Communities

Over the past couple of years the decentralization of generation has been a general trend in energy markets. At the same time, the distinction between active producers and passive consumers has become less clear. In-between forms like the prosumer who not only consumes but also produces energy have developed.[36]

This empowerment of formerly passive consumers has been enabled by falling prices for generation technologies (e.g. solar PV modules) as well as the digitalization of electricity systems (e.g. increased control functionality introduced by smart meters)[37]. Especially community co-operatives are growing in popularity, pooling resources to finance bigger investments like wind turbines or solar PV installations to serve local demand and/or sell back to the grid.[38]

The European legislator has facilitated the emergence of decentralized supply structures by creating the possibility to establish so-called energy communities. An energy community is a way for individuals as well as organizations from the non-power-sector to organize in order to consume as well as generate energy. They come in various forms such as community-based generation equipment, Citizen Energy Communities and Renewable Energy Communities.

While these new organizational forms have slightly different characteristics and requirements (such as e.g. the physical proximity of its members), the active participation of formerly passive consumers in the energy sector is a main objective of the legislator.[39] Furthermore, energy communities are expected to bring ecological, economic or social community benefits to its members or to the areas in which it is active.[40, 41]

4.1.1. Introduction to Energy Communities

In a Renewable Energy Community (REC), various types of members such as private individuals and legal entities (e.g. municipalities, local authorities or even small or medium companies) can organize together with the goal of producing, storing, consuming and selling energy that surpasses their own individual property boundaries. While REC membership is in general very open, there are some limitations.[42]

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[36] EnergyCities (2018), Wiener Stadtwerke (2019), IAEI (2017)
[37] Wiener Stadtwerke (2019)
[38] IAEI (2017), EnergyCities (2018)
[39] cf. Art 2 no 16 of the Renewable Energies Directive;
[40] cf. Art 2 no 16 of the Renewable Energies Directive;
[41] cf. Energiegemeinschaften (2021)
[42] cf. Appendix A, Decentralized energy supply through energy communities [c (iii), c(iv)]

In order to transfer energy, energy communities normally use the electricity grid of the local network operator. Local community participants are connected within the low voltage grid, while participants of a regional REC are connected within the medium-voltage grid. However that also means that RECs are limited to a local area as defined by power grid levels. Members have to be located within the concession area of a single grid.

The aim of prosumers is to consume as much energy as possible that is generated by the household or the renewable energy community itself and thereby buying less energy from the public grid for a higher price. There are various ways to achieve such a higher self-consumption rate for the focal actor.[43] One way is via changes in the consumption behavior of participants. That means shifting power consumption to times of high production (of eg. a solar PV installation) by switching on household devices at appropriate times. Another option is the use of storage systems such as batteries. Finally, a central energy management system can also help to use the generated energy in a more efficient way. These measures can increase the self-consumption rate from 20-30% to 50-70%.[44] While the balance of supply and demand within the energy community is the main goal of an energy community, normally there will be times of surplus demand or supply. Any such energy is supplied to the general net. Any energy deficit has to be supplied from the network provider.

From an infrastructure perspective, the basic requirement for all forms of energy communities is to implement operational and active “intelligent” electricity meters (Smart Meters).[45] A smart metering system is an electronic system capable of measuring electricity fed into the grid as well as electricity consumed from the grid, providing more information than conventional meters. Additionally, such systems are capable of transmitting and receiving data for information, monitoring, and control purposes, using electronic forms of communication.

Due to their near real-time capabilities, smart meters can provide close to real-time feedback on energy consumption and enable interested users to better manage their consumption, thereby saving energy and lowering their electricity bill. Furthermore, smart meters can also be the basis for dynamic energy pricing for households. Helped by smart meters, consumers can adapt their energy usage to the fluctuating energy prices throughout the day, enabling them to consume more during lower price periods and save money on their energy bills.

Additional important components of the technical infrastructure are – naturally – the generation facilities owned by the community or its members, any local community-owned grid infrastructure and energy storage systems such as batteries. Last but not least, a key component of any energy system is a software platform to manage the micro-grid.

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[43] Verbraucherzentrale (2022)

[44] Verbraucherzentrale (2022)

[45] European Commission (2017)

4.1.2. Examples

There are already many examples of Renewable Energy Communities operating in Europe and Austria. The following examples present some communities and concepts in the space.

REC Schnifis[46]

The Schnifis REC brings together a wide variety of consumers and producers. On the consumer side about 20 households and several commercial enterprises participate in the energy community. On the producer-side about 15 prosumers as well as a biogas plant and a larger photovoltaic system are connected.

For prosumers, participation in the REC has economic benefits. For instance, instead of installing a 4-5 kWp PV system optimized for self-consumption of a single household, participants in the energy community install the maximum possible capacity and are able to sell the excess electricity to the neighbors or the community – for a better price as the OeMAG[47] would take the electricity. This creates an economic incentive to participate in the REC.

Another noteworthy aspect is the participation of the biogas plant which serves several important functions within the community. First, it acts as a backup, if the photovoltaic systems are not able to produce electricity (e.g due to bad weather). Second, the participation of the biogas plant in the REC is a connection point to agricultural activities. Not only does the plant use agricultural residuals to produce electricity or heat, it also supplies agricultural operations with residuals from the plant processes as a high quality resource.

From an infrastructure perspective, the energy community does not require a separate power grid but uses the normal power grid for the transfer of actual energy. With the use of smart meters, the network operator just has to provide the data, which is required for billing.

For management purposes, the REC operates a digital platform which manages automatic billing and helps to optimize the community as a whole. The platform also gives participants a community-wide overview and visualizes the current status of energy flows. The digital platform is the heart of an energy community.

Project Atelier in Buiksloterham, Amsterdam by Spectral[48]

The focus of Project Atelier is the integration of several smaller microgrids in Buiksloterham's neighborhood in Amsterdam. The objective will be to integrate these diverse microgrids into

[46] ILAB (2021), Seidl (2021), Energiewending.at (2021)

[47] OeMAG is a central player in the Austrian energy market, tasked with the management of subsidies and related matters in relation to renewable energy sources (https://www.oem-ag.at).

[48] SmartEn (2020), amsterdamuas.com (2020)

a district-level smart-grid to better balance generation and consumption of locally produced energy while staying independent.

The microgrids to be connected are very diverse in nature (ranging from newly developed mixed-use areas to a local energy cooperative) with a wide variety of existing infrastructure (e.g. PV installations of different sizes, heat pumps, heat storage, electric vehicle charging stations, home batteries as well as a centralized battery system). Connected via Spectral's local Energy Market platform, these grids will be able to exchange energy between themselves, opening up new revenue streams for each microgrid while at the same time better balancing the flow of energy within them.

Harmon'Yeu supported by Tiko & Engie[49]

The Harmon'Yeu project is a good example for the optimization of self-consumption in an energy community. It consists of 23 households in the town Ile d'Yeu (including 5 prosumer participants) which share the electricity produced by solar panels. The project has a rate of self-consumption of over 90% of the energy produced. This is made possible by the smart management of each participant by a central party. Each household is equipped with a smart meter and a gateway to enable the management of consumption. This is used to optimally match generation and consumption of energy.

Additionally, the infrastructure of the community includes a battery solution and heat pumps that allow the storage of energy that is not immediately used. Participants are informed about their "energy activities" via a frontend app.

Cleanwatts[50]

While not an REC itself, Cleanwatts is an interesting example for a full-service provider for energy communities. The services of Cleanwatts include the installation of generation assets for a REC, provision of documentary requirements towards the regulator, negotiation with the local grid operator and the provision of management software (for energy flows and transactions). After setting up a REC, Cleanwatts also takes over operational processes for the community, such as billing, onboarding of new REC members as well as consulting members on efficiency and optimization.

As an additional benefit, Cleanwatts' offer is built as a zero-capex model for customers, meaning that any upfront investments are financed by third parties.

4.1.3. Blockchain and Energy Communities

As energy markets today are transforming towards a large number of suppliers and buyers, it is important to enable a diverse set of participants to exchange energy. The interaction

[49] SmartEn (2020)

[50] SmartEn (2020), cleanwatts.energy (2022)

between these actors and the associated processes requires a high degree of standardization and trust which can be facilitated by a blockchain-based infrastructure.[51] Normally intermediary parties are required for validating transactions and for ensuring trustworthiness of information across parties. In a blockchain-based system, these trust functions can be embedded directly into the infrastructure itself. In situations where high levels of security and data protection are required for different applications, blockchain technology can offer a transparent ledger that securely records all transactions. This eliminates the need for third-party verification. Blockchain technology has the potential to serve as an infrastructure solution for decentralized energy systems and help leverage the benefits of these systems by enabling an environment where everyone can trade, pay, and even deliver energy to others.[52]

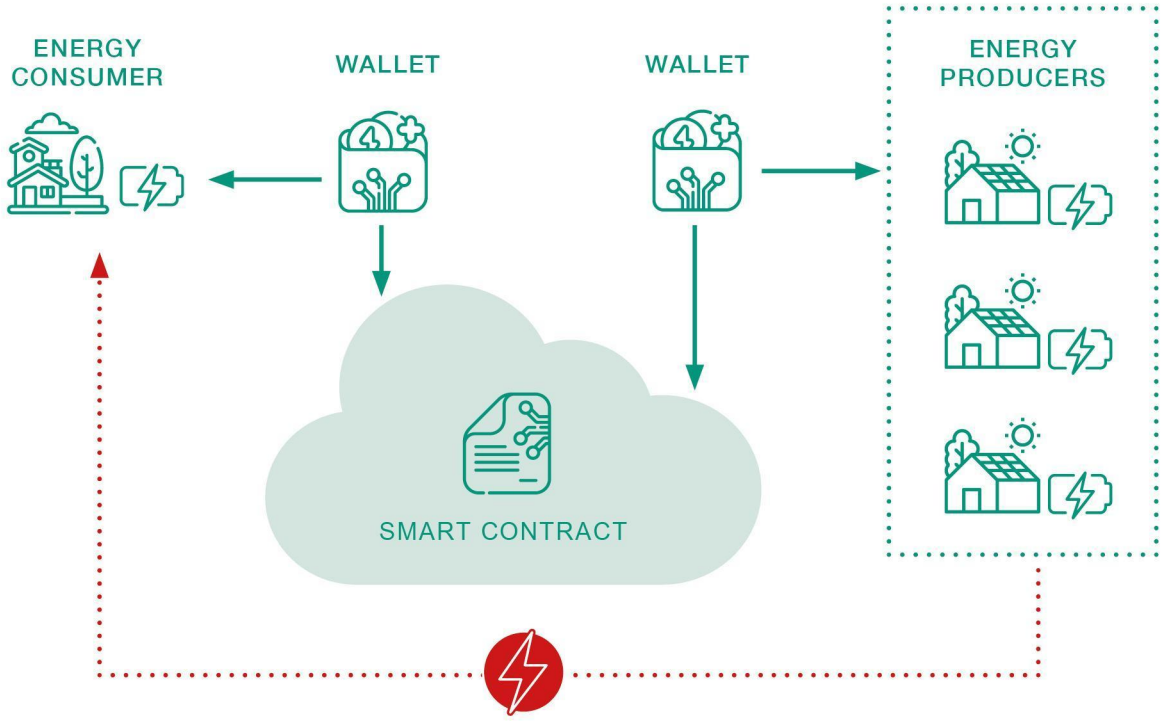

Figure 1: Basic structure of blockchain-based infrastructure for direct energy exchange[53]

Numerous use cases such as transaction processing and invoicing, documentation of asset ownership, energy certification and verification or P2P marketplaces have been suggested for or implemented based on blockchain.[54] In the connection of energy systems, and more specifically energy communities the role of blockchain is that of an information infrastructure that supports the grid infrastructure.

[51] Kouveliotis-Lysikatos et al (2019)
[52] Van Leeuwen, Gijs et al (2022)
[53] European Commission (2017)
[54] Pichler et al (2018)

The blockchain infrastructure is used to exchange information as well as value, to manage the network and to automate business logic via smart contracts. For example, blockchain can be used for Direct Energy Exchange (see figure 1 above[55]). In such a scenario a consumer will ask for energy from a smart contract on the blockchain. The smart contract automatically checks if the requested amount of energy is currently available at one or more producers. If this is the case, it will forward to them the consumer's request. At this stage, it is possible for (automatic) price negotiations between the consumer and the producer. For instance, producers might already define a fixed price for the energy they sell or they can use a more dynamic approach and set the price per request, adapting it to the current supply and demand. Likewise, the consumer may have set a maximum price on which he would be interested in buying energy and in a similar way the producer may have set a minimum price for selling energy. The negotiations can be then carried out by a smart contract that will seek to find an ideal compromise. Once the price has been agreed both parties digitally sign the agreement, again through a smart contract, and the money that will be involved in the transaction is sent to a predefined address that functions as an escrow account. The final step is to perform the actual energy transfer. Here, a middleware controller handles the energy transfer. It controls the energy flow from both the producer's and the consumer's smart meter.[56]

4.1.4. Examples

The following examples selected represent the core aspects which are examined for the REC Stanzertal. However, worldwide there are numerous use cases for blockchain technology in the energy sector.

Viertel 2 (Vienna)[57] is a small office and residential neighborhood in Vienna's Leopoldstadt district. From an infrastructure perspective, the project combines several PV-installations as generation facilities. As an additional component, an electricity storage facility with a capacity of around 70 kWh was installed in December 2019. This corresponds to the daily consumption of more than ten households in Viertel Zwei. This neighborhood storage system ensures greater efficiency and higher self-consumption, as it enables the use of locally generated solar power in the evening/at night and at times of bad weather. The battery also enables so-called "peak shaving": instead of drawing power from the grid, the stored power can be taken from the battery during peak consumption. Peak loads can be "shaved off". In the future, the storage facility will also be able to be used as an active participant in the energy market in order to sell excess electricity as balancing energy to stabilize the grid.

[55] European Commission (2017)
[56] European Commission (2017)
[57] Wien Energie (2022), Wien Energie (2021)

All energy transactions generated within the community are recorded on a blockchain-based system. This unified data layer serves as the basis for billing and the efficient use of the shared storage facility. This makes it possible to clearly trace the origin of the community electricity from the local PV system, the district storage facility or from the electricity grid. Additionally, it enables Wien Energie as the manager to offer customized tariff types tailored to participants' consumption patterns and preferences. For residents it offers the benefits that they can view their energy consumption and costs at any time via an online platform.
For the exchange in energy communities, the blockchain technology has decisive advantages, such as secure, transparent billing, complete tracing and identification. The blockchain solutions used in Viertel Zwei have been continuously developed and are already being used outside of Viertel Zwei with the public solar power plant in "Schafflerhofstraße".

Brooklyn Microgrid[58] is a pioneer in the field of P2P energy trading based on blockchain. In this US energy community each participating house in a neighborhood acts as an energy producer and consumer. When the house generates energy the smart meter records the energy production/injection and creates an energy token for the homeowner's account. The homeowner can then sell these tokens to other participants in the microgrid. Buyers of the token can subsequently use the tokens to receive energy from the microgrid. When the energy consumer's smart meter detects the inflow of energy, the tokens representing this energy are automatically destroyed.

4.1.5. Regulatory Considerations

New types of legal questions arise in connection with energy communities. These legal questions are currently discussed in the scientific community and have not been finally evaluated. Additionally, the concrete implementation of EU-wide standards is being under way. This section tries to give an overview of relevant topics and a preliminary and simplified evaluation of some relevant legal issues.[59]

Due to the high degree of regulation in the energy industry and the dependence of the economic success of corresponding decentralized business models on regulatory framework conditions, the European legislator has created specific regulatory instruments to facilitate the emergence of decentralized supply structures.
The regulatory instruments created on European level were incorporated into the Austrian legal system by the national legislator and elevated to the rank of legally recognized energy industry actors.

[58] brooklynmicrogrid.com (2015), European Commission (2017)
[59] For detailed information please see Appendix A.

The Renewable Energy Expansion Act Package[60] distinguishes between several forms of energy communities:

- Community generating installations (Gemeinschaftliche Erzeugungsanlagen – GEA) pursuant to §16a of the Electricity Industry and Organization Act 2010[2] (hereinafter: EIWOG)
- Citizen Energy Communities (Bürgerenergiegemeinschaften – BEG) pursuant to §16b EIWOG
- Renewable Energy Communities (REC, Erneuerbare Energie Gemeinschaften – EEG) pursuant to § 16c EIWOG and §§79 et seq of the Renewable Energy Expansion Act (hereinafter: EAG). The legal basis for the REC at European level is Art 22 of the Renewable Energy Directive (RED II) of 11 December 2018.[61]

Since the EAG package is still very new and there is no case law on the new energy communities, the questions of delimitation, differentiation as well as commonalities cannot yet be fully answered. A separate examination of individual cases therefore is indispensable. For this paper the focus lies on how RECs advance the production of renewable energy and self-sufficiency by creating a possibility for private individuals and other actors to join together across property boundaries. The energy produced in the REC's plants is to be used thereby again together.

From a legal perspective, a REC is a regulatory instrument to facilitate decentralized local and sustainable energy supply.

A REC's main goals are:

- to produce energy from renewable sources
- to consume its own energy, store it or sell it (esp. to its members);
- to be active in the field of aggregation and provide other energy services.
- to preserve the rights and obligations of the participating grid users,
- to respect in particular the free choice of suppliers
- to operate a grid[62].

In contrast to Citizen Energy Communities, RECs are allowed to operate not only in the electricity sector but also other energy related sectors such as heating and cooling. However, they are limited to renewable energy sources.

[60] Appendix A, Decentralized energy supply through energy communities [1]
[61] Appendix A, Decentralized energy supply through energy communities, [4]
[62] §16c para 2 EIWOG

Thus, a REC's purpose may not be financial gain, nor may members or shareholders regard energy production as their main commercial or professional activity. Generators controlled by a utility, suppliers or other electricity traders may not participate in a REC. However, the current legislation has not defined clear guidelines on the participation of subsidiaries and associated companies of such energy providers. Thus the preconditions for participation must be examined in detail for the case in question.[63]

Local delimitation and the definition of close connection to the consumers ("Nähekriterium") affect grid usage charges and are a distinct criterion between local and regional RECs as far as local or regional tariffs are concerned. The REC users are exempt from payments such as the Renewable Energy Contribution or the Green Gas Contribution for their energy purchase. Electricity that is generated but not consumed within a REC can be subsidized by market premiums up to a maximum of 50 % of the total amount of electricity generated within a REC.[64] However, no market premium is granted for the electricity consumed by the members or the community.

Ownership is assigned to the community itself, its members or third parties. The power of disposition of these plants must in principle accrue to the community itself, except for prosumers, the self-consumption by community members. The operation and maintenance can be taken by third parties (e.g. energy companies). Contracting and leasing models are also permissible. Furthermore grid users have a legal right towards grid operators to participate in an energy pool. Metering and billing as well as information obligations are also regulated according to present legal standards. Municipalities or municipal enterprises not bigger than SMEs may participate in a REC if the energy generation does not lead to profits by marketing and selling to third parties. However, if the electricity was used only for the benefit of its members or the sale made exclusively within that municipality, a specific local reference occurs and a profit orientation would therefore be denied.

[63] Appendix A, Decentralized energy supply through energy communities, [10]
[64] Appendix A, Decentralized energy supply through energy communities, [17]

4.2. Local Currencies

4.2.1. Introduction to Local Currencies

According to Kennedy and Lietaer (2004), complementary currencies are "a general agreement within a community (...) to accept something other than the official legal currency for the exchange of goods and services". In Austria, the National Bank is the exclusive authority to issue banknotes. (see also below 4.2.3 Regulatory Considerations).[65]

Bode (2004) defines four characteristics that distinguish a local currency from “main means” of payment, such as the Euro:

- the use and acceptance of a local currency is voluntary, as it is not an official mean of payment,
- it is valid in a defined geographically limited area and bears a regionally specific designation in each case,
- when it is exchanged for another regional currency or for the national currency, it incurs an exchange fee,
- no interest can be earned with it.[66]

Central to this is the so-called circulation impulse: This ensures that money remains in circulation and is repeatedly returned to the local economy. Kennedy and Lietaer assume that a local currency is successful if it is used for 30% of all economic transactions in the geographically defined area.[67]

4.2.2. Examples

In the following selected examples of an analog local currency in Austria as well as blockchain-based local currencies from Europe are presented:

Waldviertler, Lower Austria, Austria[68]

2005-2016

The Waldviertel region, like many peripheral rural regions in Austria, is strongly affected by a loss of purchasing power, population decline and emigration as well as a

[65] Roth (2012) p. 15
[66] Roth (2012) p. 19
[67] Roth (2019)
[68] walviertler-regional.at (2017)

challenging regional economic situation. In order to counteract these negative developments in the region and to strengthen identification within the region, the Waldviertel currency was introduced in 2005 as a complementary currency to the Euro. In 2016, the regional currency was discontinued.

The Waldviertler is one of the oldest complementary currencies in Austria and was the "internal payment instrument" of the association for regional economy from the Waldviertel. The association is considered the initiator of the local currency and also administered it until 2016. Legally, the Waldviertler is equivalent to a voucher system.

In 2008, the Association for Regional Economy entered into a cooperation with the Volksbank in Heidenreichstein, which from then on was the central issuing point for the local currency.
The cooperation with the bank also simplified participation for businesses and companies in the region and ensured counterfeit protection due to the consecutive serial number of the vouchers. In the event of financial damage that could arise from the use of the local currency, the association and the bank were each liable for 50%. In order to prevent the currency from being held back and to secure its circulation, measures were taken in this regard. Thus, the Waldviertler lost 2% of its value per quarter, which created an incentive for the rapid circulation of the Waldviertler. The validity of the "vouchers" was limited to one year. When a Waldviertler was purchased, 1 Waldviertler was equivalent to 1 Euro.

In 2013, it was possible to pay with the Waldviertler regional currency at a total of 206 member businesses. In 2009, there were about 40,000 Waldviertler in circulation. Starting in 2011, the municipality of Heidenreichstein in Lower Austria made it possible to pay municipal taxes with the Waldviertler local currency.[69] In 2016, about 55.600 Waldviertler were in circulation.[70]

In 2016, the Waldviertler Association for Regional Economy had to discontinue the Waldviertler local currency due to cost savings by local banks and the end of the cooperation in this regard. In an interview with the Wiener Zeitung, a member from the association explained that they could not have done it with volunteers alone.[71]
This example shows that the administration of a local currency involves a lot of effort. By introducing a DLC, this effort can possibly be reduced, increasing the chances of success for such a currency.

[69] Wikipedia (2018)
[70] N.N. (2014)
[71] wienerzeitung.at (2017)

Relevance to Stanz:

- *Strengthening of the regional cycle / regional value creation.*
- *Networking of different population groups through common use of the Waldviertler*
- *Foundation of a regional identity*
- *Raising awareness for regionality and emission reduction by purchasing locally*
- *Need for professional management or for automation of administration*

Elio Token, Lebrija, Spain[72]

Introduced since: 2020

With the onset of the Covid-19 pandemic, the city of Lebrija in the province of Seville introduced the Elio token to strengthen the regional economy and socially weaker citizens. In the process, the municipality circulated a total of €60,000 in tokens. This money came from the municipal fund, which was originally earmarked for events in the city, but could not be used for them due to the pandemic.

Based on a small basic income, around 600 citizens of Lebrija are thus entitled to the token and can receive a financial contribution of a maximum of € 200.

Families receive tokens worth €50 per child and have a total of three months after receiving the Elio tokens to spend them. One Elio token is equivalent to one Euro.

Eligible persons download the Elio app for their smartphone and register as a "user". To do this, a user name, phone number, e-mail address and password has be entered and the privacy policy has to be accepted. Subsequently, the municipality receives a request about the Elio token application. If this is checked and approved, the tokens are displayed in the app and can be used there. Subsequently, the people who are entitled to the Elio token can

[72] lebrija.es (2020)

make their purchases at participating service providers and stores at a 50% discount. The remaining 50% of the price will be reimbursed in the form of Elio tokens.
It is important for participating entrepreneurs who also use the Elio service that the invoice is issued in the name of the buyer, indicates the invoice number, the date, the name of the purchased item/service, and shows the VAT. This invoice is then photographed by businesses within the app. If the invoice is uploaded in the app, the entrepreneur will be reimbursed by the municipality for the remaining 50% of the purchased amount. Thus, companies have the opportunity to be reimbursed for the Elio token in the form of Euro by the local government.

In general, only people and companies that are located in Lebrija and thus live there or have their location there can use the Elio token. Therefore, the token cannot be used beyond regional borders. It is also not possible for private individuals who are entitled to the Elio token to exchange it for Euro. The app is available free of charge in the respective app stores. Providing the app cost the municipality around €12,000.

Relevance to Stanz:

- *Strengthening the local economy*
- *Motivation to buy in the village*
- *Additional financial support for socially weaker citizens during the Corona pandemic / ad. Stanz: support with energy poverty*

EnergieKnip, Emmen, Netherlands[73]

Introduced since: January 2022

The EnergieKnip serves to incentivize environmentally friendly behavior of the citizens in the municipality of Emmen, the Netherlands. The municipality has earmarked a total of € 150.000 for this purpose. Currently € 60.000 has been spent. The pilot project will continue until the budget of € 150.000 is completely used up.

To participate, postcards with QR codes were sent out to a total of

[73] EnergieKnip (2022)

49,000 Emmen households. Subsequently, people who want to receive the EnergieKnip have to download a free app from the respective app stores and scan the QR code on the postcard to register. Each QR code corresponds to a wallet and can therefore only be redeemed once. Following this, a wallet is unlocked in the app. By completing questionnaires in the app, participants can collect points and earn an "energy-saving box". The questionnaires essentially cover the topics of individual energy management and awareness. For each fully completed questionnaire, participants receive five points in the app, which correspond to a value of €5.

Thus, users can collect a maximum of 50 points in the app, corresponding to a value of € 50. With the points generated by the questionnaires, users of EnergieKnip can buy energy saving boxes in selected DIY stores in the municipality of Emmen. These energy saving boxes contain, among other things, LED lamps, radiator foils, pull strips, etc., which are intended to help save energy in the home.

DIY stores where the energy saving boxes are available will be reimbursed by the municipality in the form of Euro for the points they receive.

Relevance to Stanz:

- *Monitoring energy saving behavior of the citizens of Emmen with questionnaires*
- *Support to reach the climate goals*
- *Incentivization of energy saving in the population*
- *Strengthening of the regional added value*

4.2.3. Regulatory Considerations

This section tries to give an overview of relevant topics and a preliminary and simplified evaluation of some relevant legal issues with regards to regional or local currencies.[74]

Regional or local currencies have the same functions as money: medium of exchange, unit of account and store of value. However, they are based on an individual contractual basis and do not qualify as a legal tender.[75]

The characteristics of a regional currency are

- geographical limitation
- voluntary participation
- no general acceptance obligation

[74] For detailed information please see Appendix A.
[75] See Frießnegger, Einführung einer Regionalwährung, RFG 2012

- limited period of validity (expiry date),
- regularly renewed during their validity period and counterfeit-proof
- not money in the legal sense

From a civil law perspective they are often qualified as vouchers. Their characteristic features are that, firstly, they are issued by a certain entrepreneur and, secondly, they entitle the customer to choose goods from the range of products of this entrepreneur up to the maximum amount of the voucher's nominal value. A special aspect is that the validity of such a voucher goes beyond the two-person relationship between the entrepreneur and the customer.
The regional currency in form of a voucher is issued by a central body in the region (e.g. municipality), but can be redeemed at several entrepreneurs who agree explicitly to this process in advance. This multi-personal relationship does not change the legal qualification as a voucher.[76] Since the characteristics described above are also present in a virtual regional currency, the comparison to (digital) vouchers can also be made here.

In addition to civil law aspects, tax law, data protection law (storage of customer data) and regulatory aspects should also be taken into account.

Tax Law:
VAT treatment of vouchers was standardized in the EU by the Voucher Directive in 2019[77], also introducing a definition of the term “voucher” and making a distinction between single-purpose and multi-purpose vouchers.[78] In brief, the multi-purpose voucher is treated like payment for a service consumed and VAT is applicable when the voucher is redeemed.

Regulatory aspects for a regional currency:
§ 4 para 2 National Bank Act (Nationalbankgesetz – NBG) stipulates that the Austrian National Bank (Österreichische Nationalbank – OeNB) has the exclusive right to issue banknotes. In the case of regional currencies, there is no infringement of the monetary monopoly, as they are not legal tender and usually are used in addition to the Euro. In the case at hand an implementation of the regional currency does not seem problematic, especially as the community of Stanz already has a local voucher system, the “Stanz Gutschein.” However, restrictions from a supervisory law perspective are likely to occur due to potential concession obligations following the E-Money Act 2010.[79]

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[76] See Frießnegger, RFG 2012, 138; FMA Letter 01/2020, 18
[77] Appendix, cit. 20
[78] Art 30a no 1 Directive on the VAT system and Art 30a no 2 and 3 Directive on the VAT system, cit. 21 of Appendix
[79] https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20007043 accessed on yyyyy

In the case of issuing regional currencies (in the form of tokens), the E-Money Act 2010 could be applicable. The FMA considers payment tokens as e-money on principle, since payment transactions are to be carried out with them and they are accepted by third parties in lieu of payment.[80] Due to the application of the E-Money Act, the issuing body (e.g. a municipality) would have to be licensed by the Financial Market Authority (FMA) as an e-money institution. However, the exemption of a limited network pursuant to § 2 para 3 no 1 E-Money Act could be relevant. In this case, the concession obligation would not apply. This would be the case if returning the voucher to the issuer against reimbursement of the purchase price.
Small and specific systems should not fall under the strict supervisory laws. However, as soon as the system allows for broad applicability, regulatory provisions may be relevant. In principle, open networks therefore do not fall under the exemption rule, as they are usually intended for a constantly growing network of service providers. Broadly accepted tokens will thus in any case not fall under a limited network.[81]

According to the FMA, whether a limited network exists is to be determined by the following criteria:

- geographical range of the system
- the number of acceptors
- the diversity of products and services
- validity limits and any amount limits may also play a role.

In general, the FMA uses the different questions as criteria for the supervisory assessment of whether a concession obligation may exist.[82]

[80] OGH 6 Ob 169/15v = VbR 2016/22.
[81] § 11 para 1 Distance Selling Act (*Fern- und Auswärtsgeschäfte-Gesetz – FAGG*). The provision does not contain an exception for cases where a voucher is sold. Although a waiver of the right of withdrawal for services pursuant to § 18 para 1 no 1 FAGG is possible under certain conditions, according to the Austrian Supreme Court the sale of a voucher is not always to be qualified as such a service. Rather, it should be classified according to whether the transaction to which the voucher refers is a purchase or service contract.
[82] Frießnegger, RFG 2012, 138.

5. Field Research & Participation Process

5.1. Preparation Process

As part of the preparation, research regarding other comparable implementations or research projects was conducted. The ELIO and Energy Knip cases have already been described in chapter 4.2.2. Important lessons learned were integrated from the INTERREG IV project "BLING - BLockchain IN Government", where the EnergieKnip in Emmen in the Netherlands was also implemented. The experiences in the communication of blockchain-based projects were summarized in a project report.
Three communication goals were identified for that project: "a) Demystify and de-risk blockchain technology and blockchain-enabled applications to support more effective local government service design and delivery through pilots, case studies, presentations and reports. b) Support governments and citizens to identify appropriate use-cases for blockchain- enabled services that identify when DLT technologies should or should not be used in service development and delivery that leverage new forms of data-sharing and identity-management to build more effective and better targeted services. c) Increase awareness of lessons learnt from the deployment of Blockchain-enabled services […]"[83]

The communication strategy was to enable framing for the project: „At first, we need to address the question: If blockchain is a solution, what is the problem? Keep in mind that your target group might not be aware of the problem you are trying to solve. So, instead of talking about blockchain as a technological solution, we need to address a storyline [...] about the public challenges blockchain can solve"[84]. Based on this, three key measures were formulated, which were always used for communication.

Since the topic of "blockchain" is often associated with bitcoin and other cryptocurrencies and these are equated with speculation, tax avoidance, criminality and immense energy expenditure, the experiences from the BLING project were very important for the preparation of the field phase in Stanz im Mürztal. Also the decision was made to be very careful with the term blockchain and the following key messages were developed:

1. In order to automate administration and billing within the REC, save overhead costs and enable more flexible electricity load profiles, it makes sense to digitalise the REC Stanzertal.
2. As part of an energy participation project, Wien Energie (see chapter 4.1.2) distributed revenues in the form of energy credits or vouchers for the supermarket chain "Spar". Since Stanz does not have a Spar supermarket, but a local grocery

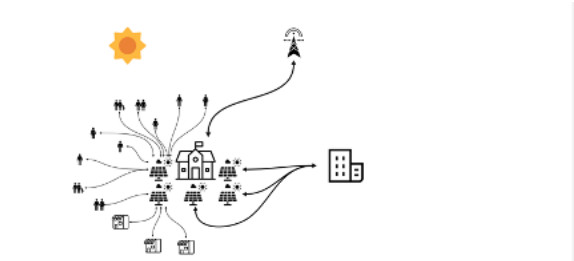
[83] Thors (2019), p.5
[84] ibid

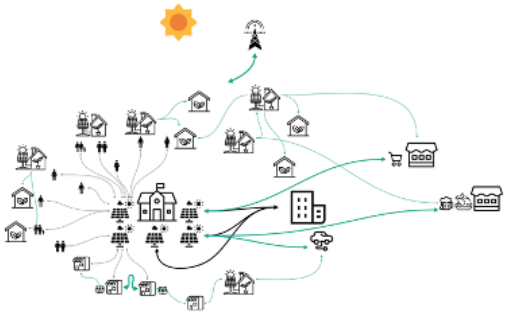
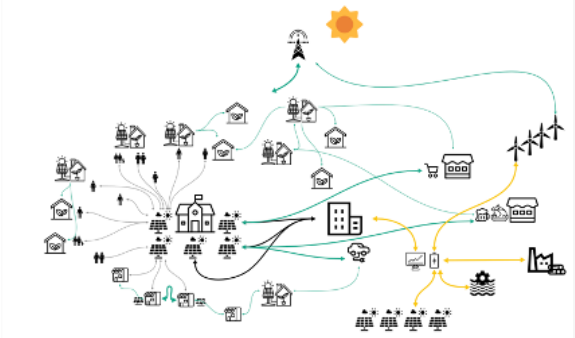
store and supplier called “Trixis-Dorfladen”, specializing in regional and organic products, a local currency could be generated, namely shopping vouchers for local businesses.

3. If the REC Stanzertal is generally digitalized, the local currency can function as a digital variant and be based on the already existing Stanz voucher.

These project contents were discussed with the founding members of the REC Stanzertal. Furthermore, it was possible to build on the preliminary work of the FFG project Stanz+. Within this project, innovative energy services and business plans for the REC Stanzertal were developed together with Thomas Zeinzinger from Lab10 and 7Energy 10 in the work package on the "Rural Pioneer Community Stanz". These were partly used as a basis for research and participation in the present project.

Furthermore, an attempt was made to schematically illustrate the step-by-step set-up of the energy community in Stanz by using pictograms. The content structure and the moderation processes for workshops and focus groups were based on this.

	**Current status:** The main energy supplier is E-Werk Kindberg. Individual households have private photovoltaic (PV) systems. The electricity produced is used for self-consumption. Surplus electricity has to be sold back to the energy supplier at predefined prices. Furthermore, there are two wind energy parks in Stanz with a capacity of about 75 mWp. The electricity produced here mainly goes to industrial enterprises outside the municipal area.
	**Stage 1 of the REC:** A PV power plant is installed on the roof of the school and the culture hall (approx. 800 m2) in Stanz. Individuals, private households and businesses can participate in funding the facility. This should give households that do not have the possibility to install a PV system themselves an opportunity to receive locally produced electricity.

	Furthermore, this is a safe possibility for financial investment with a better interest rate than a savings account (planned implementation summer 2022).
	**Expansion stage 2:** When the practical possibilities for implementing RECs are given, P2P electricity trading within the community is started. Tariffs can be decided collectively by the REC. The community plant is integrated into the structure. Surplus power no longer needs to be sold to the energy provider. Households, local businesses and restaurants can purchase locally produced electricity (planned implementation autumn/winter 2022).
	**Expansion stage 3:** The energy community is digitized and a coupling to other sectors of energy production is carried out: Water and biomass and perhaps wind at a later stage. Sector coupling enables more constant electricity production and the combination with the biomass heat power plant provides an opportunity to store surplus electricity or use it for heat production (Power2Heat). Other large-scale private plants can be integrated. Furthermore, there is the possibility of automated shifting power consumption: If there is a lot of surplus energy in the REC, private households or commercial enterprises can shift their electricity demand "just in time" to this point in time (private heat production, washing machine, cooling in local shops and restaurants (planned implementation from autumn/winter 2022).

Expansion stage 4: According to the developed concept in this project, electricity is traded within the energy community, electricity is stored with innovative solutions, sectors are coupled and load profiles are shifted in order to increase energy efficiency and achieve cost reductions. The REC Stanzertal is fully digitalised. Blockchain technology is used for the documentation and billing of electricity trading. An energy token is automatically generated for each kWh exchanged. Based on this, a Stanz Token can be generated, which acts as a local digital currency. In this way, private households can save costs, energy-saving measures are taken and a reduction in consumption is initiated, purchasing power is tied to the locality and financial flows to fossil energy production countries are reduced, value creation cycles are closed at the local level, the local economy as well as the community and the municipality are strengthened and more resilience is achieved.

As these diagrams are complex and not self-explanatory, they were only used in a reduced form in the research and participation process.

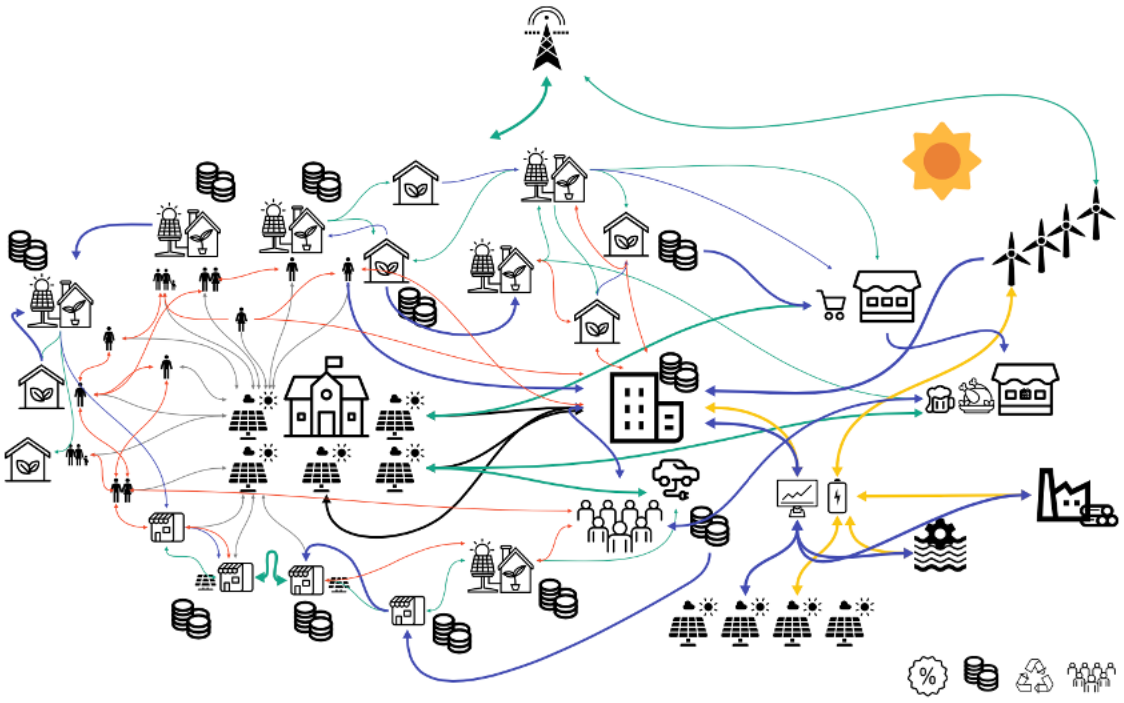


Figure 2: Expansion stage 4 of a digitized energy community

5.2. Results of Interviews and Stakeholder Workgroups

In the following, the results of the field research and participation are structured in terms of topic and summarized. The detailed description of the research process can be found in the appendix.

General acceptance of a DLC in the community

The idea about the introduction of a Digital Local Currency (DLC) - based on the local energy production in the renewable energy community Stanzertal (REC Stanzertal) - was overall very well accepted within the focus groups and by the interviewed persons. Many stakeholders favored a limitation of the validity of the DLC to the geographic community area of Stanz im Mürztal. This should strengthen local identity, cohesion, as well as the local economy and local producers.

It is important that easy access for the DLC is guaranteed and that there is also an analog version for people who do not want to or can only use digital media to a small extent. These people are referred to as non-digitals in the following. These non-digitals, but also other people, want the analog counterpart in order to be able to hold the currency in their hands. But also to be able to use it as a gift.

The DLC should be easy to use and the individual steps for its usage should be described in a manual. There should also be workshops for non-experienced smartphone users on how to use the DLC.

When using the DLC, the focus must be on ensuring security and data protection. Therefore, the members from the focus groups and interviews see the municipal office as a good possible "intermediary for data management" for the DLC. Further, powerful measures are needed to be protected from hacker attacks. Also the anonymization of data and the use of as little private data as possible, must be ensured for the consumers of the digital local currency.

If these concerns can all be addressed, the digital local currency can be a good payment alternative in Stanz, especially in these times of price and currency uncertainty. If there is a fixed binding to the Euro, as envisaged, there are indeed no possibilities to react to inflation. But apparently, with the current increase in global uncertainties, people tend to put more trust in local economic cycles and networks. In this respect, this finding from the field research should be taken into account in the design of the currency.

- *Digital local currency should only be valid in Stanz im Mürztal*
- *Easy access must be guaranteed*
- *Analog form for non-digitals*
- *Simple operation and manuals for the use are needed*
- *Data protection and anonymization must be a priority*
- *Digital local currency as a good alternative in times of economic uncertainty*
- *Strengthening of value creation and identity with Stanz*

Volunteers, societies, associations and Social Remuneration

In Stanz im Mürztal, more than 80 people participate in the sustainable community development on a voluntary basis. A large part of the population benefits from this. Among other things, the community e-taxi is operated, the swap shop is managed, campaigns are held to improve the living environment and a wide variety of events are organized. In addition, there are about 35 associations in Stanz, which have an important function for the community and quality of life.

Overall, the focus groups and interviews revealed that the issue of remunerating individuals in the field of volunteer work was seen to be critical. The main issue here was who should receive remuneration and how the value of different activities can be measured. The fear was expressed that this would create more resentment and mistrust between volunteers. For this reason, intensive thought was given to what other possibilities there are for integrating volunteers into such a system of a DLC.

The (partial) payment of association grants in the DLC instead of Euro seems to be far more practicable. This could add local value through the regional purchase of products by societies. The idea is to promote a higher amount of funding in DLC in order to increase the acceptance of the DLC. Membership fees in societies should also be payable in the DLC.

In addition, the municipality holds a social fund to provide financial assistance to families and households in times of crisis. Especially in this period of massively increasing energy costs, there are more and more households that are affected by "energy poverty". Since the DLC is based on local energy production, this could be a coherent and useful combination. Thus, a separate social tariff for financially weaker members could be created within the REC. In this way, energy poverty can be tackled in a sustainable way. It should also be possible to receive the energy and heating subsidy, which is paid out in communities in Austria, through the DLC.

- *Volunteer work should not be remunerated*
- *Payment of association subsidies*
- *Payment of membership fees in societies should be possible*
- *Strengthening the social fund of the municipality*
- *Fight energy poverty through DLC*
- *Payment of energy and heating subsidies in DLC*

Prosumers and Renewable Energy

Participation in a REC should not and cannot be done primarily out of economic interest. For private households and prosumers, the expected returns and savings are too low. Therefore, the focus should be primarily on local involvement, community spirit, and environmental action. However, as described in chapter 4.1. Energy Communities, there are financial incentives for membership in a REC in Austria in accordance with the Renewable Energy Sources Act (EAG) 2021: reduction of the grid usage fee and a reduction of various charges.

Thus, it was discussed in the focus groups that "money" or the DLC can be created directly from photovoltaic systems. This occurs when surplus electricity (that which is not consumed in the household) is not sold back to a commercial power distributor, but is traded within the energy community. In this way, DLC can be generated and, for example, the pizza at the kiosk at the bathing lake can be bought with the DLC. This creates an energy-economy cycle within Stanz.

For producers, prosumers and consumers of the EG-Stanzertal own contracts, supply agreements, are created. This is done on the basis of a cost effectiveness calculation according to a non-profit or not-for-profit organization. In these contracts, the principles of trading with the DLC in the intra-community exchange of electricity must be specified. A small difference between the prices for electricity purchase and electricity sale must be taken into account in order to be able to cover any overhead costs occurring for management, billing and administration. When implementing a DLC, the costs related to this must also be covered. Financial surpluses generated by REC Stanzertal through electricity trading or by the community through the operation of the planned community facility can be invested in new facilities or for social purposes, as discussed before.

The focus groups also discussed the possibility of making tariffs flexible. In this way, energy-efficient behavior could be incentivized: For example, shifting power consumption is used to consume more electricity during midday hours when there is currently a lot of available surplus energy in the REC.

By creating the energy community, sustainable community life is strengthened and thus it can succeed in accelerating the energy transition at the local level and reinforce the sense of community within the municipality.

- *Immediate creation of DLC through electricity generation*
- *Creation of a local energy-economy cycle*
- *Generating value and incentives through load shifting*
- *Incentives to participate in the REC Stanzertal*
- *Forcing sustainable and resource-saving community coexistence*

Options for payment

People who produce surplus electricity in their photovoltaic system can sell the energy within the REC and earn DLC and consumers in the REC can purchase energy via the DLC.

As mentioned, the DLC should only be valid within the municipality. In this way, the creation of regional value and local identity can be strengthened. The focus group members want to spend the DLC primarily on municipal taxes. On average, community taxes for a four-person household in Stanz amount to about €1,500 per year. Prosumers and producers from the energy community would like to be able to pay the municipal taxes with their surplus generated from PV systems. This should be able to be conducted automatically with the municipality in the background within the app if required. Another area of application should be the gastronomy located in the village. For example, it should be possible to pay for coffee or after-work beer consumed in the pub using the DLC. In general, stores and service providers within Stanz should accept the DLC as a means of payment. For example, everyday needs at the grocery store "Trixi's Dorfmarkt" could also be purchased using the digital local currency. The only gas station on site should also accept the DLC as a means of payment and thus also make refueling with the DLC possible. Direct marketing by farmers in the village should also be a sub-sector for the DLC. Interviews and discussions were held with selected stakeholders and there is considerable interest in the use of the DLC.

In terms of regional value creation and energy transition, business to business trade should also be possible with the DLC. Explicitly, this means that the local biomass operator would also like to pay for wood via the DLC. And Trixi's village store should also be able to remunerate its local suppliers with the DLC.

For representation, the DLC should also be available for gift-giving occasions and investments. For example, birthday vouchers can be re-gifted in the form of the DLC. The municipality should also be able to give the DLC to citizens for anniversaries and honors. As

mentioned earlier, the DLC should be available in analog form of a coin with QR code at the municipal office.

Leisure activities at the local lake are of great importance to the people of Stanz. This bathing lake is freely accessible to the population. The DLC should be used to support campaigns and to buy snacks at the kiosk located there.

Reinvestment of the DLC in further photovoltaic plants should also become possible.
In general, there is an idea from the population to not allow the DLC to be exchanged back into Euro up to a threshold of about 200€ to 300€. Beyond that, however, the possibility should be given.

- *Payment of municipal taxes i should be able to be processed automatically, if desired*
- *Gastronomy*
- *Goods for daily needs*
- *Gas station*
- *Direct sales at farms*
- *Gift occasions and private investments*
- *Local suppliers for tradesmen from the Stanz (b2b)*
- *Reinvestments*
- *Saving of DLC at the wallet: max. 200-300€ equivalent in DLC, every larger amount should be able to be exchanged in Euro*

Businesses and Companies
From the interviews and focus groups with tradespeople within Stanz, it is clear that their acceptance of the DLC is also very high. The business owners see the opportunity that increased local added value by purchasing in the village will build resilience for the economy. Especially in this time of inflation, when customers are increasingly shopping for discount offers, measures to support the economy are welcomed.

In essence, tradespeople see the DLC as a digital complement to the already established Stanz voucher. The digital form of the voucher could ease the current complicated process of the voucher system: When customers currently pay with vouchers, traders must validate them at the municipality and subsequently receive their sales back in Euro. The DLC could simplify this process for traders.

For the general acceptance of the DLC, it is particularly important to create technical interfaces for the different accounting systems in advance, so that adequate accounting is possible in the traders' bookkeeping.

With the DLC, traders also want to pay municipal taxes, suppliers from the Stanz and obtain electricity from the Energy Community. Nevertheless, it is important for them that the DLC can be made exchangeable in Euro.

Discount promotions for payment with the DLC can be used to incentivize customers at tradespeople to circulate the DLC.

- Very high acceptance among participating tradespeople
- Increase in local added value
- Digital supplement to the analog DLC
- DLC should be exchangeable in Euro
- Payment of suppliers / purchase of electricity from energy community
- Need to establish in accounting systems
- Payment of municipal taxes
- Discount promotions for payment via DLC in stores / service companies

5.3. Open Space Conference

The aim of the conference was to exchange and discuss previous results from the field research and participation as well as with regard to the token design at expert level. In addition, further relevant aspects were developed with individual stakeholders and results were questioned and validated. The conference was held as an expert workshop on 6th May and as an open space event on 7th May. The open space started with a welcome by Mayor Fritz Pichler, followed by a Keynote entitled "Digital Local Currencies for Energy Communities. Potentials, Challenges and Current Examples" by Prof. Alfred Taudes. He covered topics ranging from energy communities to local currencies to blockchain with individual case studies. As conclusion, he stated in the keynote:

- RECs provide an important contribution to the energy transition
- Numerous advantages offered by RECs
- Decentralized billing infrastructure creates flexibility.
- Flexible infrastructure for expansion of an REC into innovative areas of activity
- RECs form the basis for local currency to strengthen the regional economy

The keynote and a Q&A session were followed by discussions at two work tables. Moderated by Alfred Taudes and Vinzenz Treytl (ABC Research), the relevance of a DLC and the goals and intentions of a REC were elaborated with the participants in the two groups. The main focus was on legal issues, potential ways of implementation and possible synergies as well as the added value that is created for individuals and the community..

Figure 3: Open Space Conference, Stanz im Mürztal, Presentation Alfred Taudes

Figure 4: Open Space Conference, Stanz im Mürztal, World-Café, Topic development

The following topics, questions and aspects were identified as relevant for the project:

Technical and legal issues

- Define the goal of the REC and the introduction of a local currency in Stanz.
- Well-founded planning and design in the context of the REC Stanzertal: Bring together all data that are available to create a basis for a participatory decision-making (value and money flows among each other).
- Remain flexible in the concept: Do the REC and DLC topics have to be linked or can the two topics be thought of in separate ways? (digital counterpart to the Stanz voucher).
- It is to be considered: The value of money is not determined by the quantity, but by the speed of circulation.
- Regulatory sandbox as a useful way to try things out before going into the final phase[85, 86].
- There is an appropriate moment to involve the Austrian Financial Market Authority (FMA): This should not be too early, as the concept may not be mature enough at that time. But also not too late, otherwise the FMA may feel bypassed.
- Stanz could be a possible sandbox: a provisional license is granted and the concept can be tried out and experience gained without taking legal risks. These experiences are then also interesting for other regulatory authorities.

Social / Social Innovation.

- Involve as many people as possible in the discussion and development process.
- We need the entire Stanzer population or REC on board for the local currency. Create a common understanding. Continue the participation and negotiation processes on the municipal level.
- There will always be groups in a community that are "against". How do you engage them? Communication is necessary: inclusion and integration.
- The suffering is increasing in the current crises. Offers can be made here to address this. The benefits for the people and the community must be clearly identified and communicated.
- Potential target group: young people as digital natives. We need influencers: they can communicate benefits and show use-cases.
- It is easy to try out incentives for climate-friendly action with the technical tools (note: a wallet): Start actions without much effort and stop them if they don't work.

[85] A “regulatory sandbox” refers to a regulatory framework in which companies can develop and test new business models in close cooperation with the regulator. This relatively new instrument is commonly used to foster innovation in highly regulated sectors such as financial services. (see: FMA (2022))

[86] see: BBVA (2018)

- Use open source in the technical implementation: Code is open and thus replicable for other energy communities.
- How can energy saving be rewarded? This is an important question: With a primitive design of software solutions, more energy is consumed than gained.

Figure 5: Results of the World-Café

A detailed description about the contents and topics of the Open Space Conference can be found in the appendix.

5.4. Review of the Participation and Co-creation Process

A report on "Guidelines to optimize energy-efficiency information campaigns and citizen participation for collective action and energy communities with practical views and methods" was published as part of the Horizon project DECIDE in June 2022. These guidelines are based on a behavioral science perspective. A review shows that the participation process in the present project "Stanz Token" corresponds to a high degree to the recommendations for the activation of citizens for collective actions in this research paper.

Based on the analysis of best practices, a concept for communication in the context of RECs and collective energy action was developed and a four-step plan for involvement was

developed on the basis of other research on the topic. This includes the following levels, which build on each other and go from low to high involvement[87]:

- Inform: creation of understanding and know-how
- Consult: gain feedback and get input from the stakeholders contacted
- Include: working directly with stakeholders throughout a process
- Collaborate: stakeholders are integrated in different aspect of decision making

Among others, the following interventions are recommended for the individual phases[88]:

Inform:

- Flyers / Postcards
- Newsletter
- Promotional Video
- Media Campaign
- Collective efficacy information
- Communication for trust
- Energy Feedback

Consult:

- Semi-Structured interviews Surveys
- Information sessions
- Site visits

Include:

- Consensus Workshop
- Engagement-Event / Drop-in- event
- Focus Groups

Collaborate:

- Community Mapping
- Town Meetings
- Workgroups / Forum

In retrospect, many of these proposed interventions were implemented in the research and participation process in this project. It has already been mentioned in this report that over the last few years, trust has been built up within the population regarding the path of

[87] cf. Bielig et.al. (2022) p. 21 - 23
[88] cf. Bielig et.al. (2022) p. 25f

development in Stanz. Since the introduction of new technologies with the system of a DLC is a highly innovative project with an experimental character, it is necessary to avoid failure, as this can otherwise be accompanied by a loss of trust. Bielig 2022 et. al. go into principles of communication for trust and refer to the integrity, benevolence and competence model by Mayer, Davis, & Schoorman. The authors characterize this as follows: „Competence refers to the ability to realize promises, based on adequate knowledge, expertise, skills, leadership, and other characteristics in related domains. Benevolence implies having a sincere concern for customers' interests and the motivation to do good for them, while integrity means the adherence to a set of sound principles. Each of these components helps to increase a trustworthy perception of an organization or person. When the three factors are met, a high level of trustworthiness is perceived"[89]. And provide an overview of recommendations regarding communication for trust:

Figure 6: Recommendation overview - communication for trust concepts[90]

[89] see: Bielig et.al. (2022 p. 30)
[90] Bielig et.al. (2022 S. 31) - own revision

5.5. Stakeholder Analysis

Since the methodology used in the project was based on grounded theory, no specific stakeholders were defined for the project in advance. With this method, a process-oriented and process-open approach was taken. Thus, no fixed sampling was determined. However, the starting point was a stakeholder analysis for the topic of municipal energy transition, which was prepared together with Pavlos Georgiadis (ECOLISE) in the summer of 2021 as part of the Smart Rural 21 project.

The relevant stakeholder list emerged during the participation processes by identifying - together with the participants of the interviews and focus group discussions - the actors for the REC and the Stanz Token and their significance for the village and the upcoming actions. Based on this, external and institutional stakeholders were added to the list.

In general, stakeholders can be divided into three clusters/groups:

- Institutions or individuals that operate the power grid and provide energy on a commercial enterprise basis (power grid operators, power supply companies, power distribution companies, commercial operators of renewable energy systems).
- Persons and organizers who consume or prosume from the energy community and are holders of the Stanz Token within the community.
- Control bodies and funding institutions.

5.5.1. Energy Producers / Suppliers

The existing energy producers and energy suppliers as well as the operator of the energy grid play a central role for the REC Stanzertal. The regional grid operator "E-Werk Kindberg" is crucial, because the supply area of the electricity grid is the legal spatial boundary for participants in the Energy Community. The Renewable Energy Expansion Act Package (EAG Package), which was passed in July 2021 and is the national implementation of the "Clean Energy for all Europeans Package" (CEP) of the European Union, foresees the following: Renewable Energy Communities are limited to the "near area", which is defined in the electricity grid by the network levels.

Since E-Werk Kindberg is the grid operator through which the energy exchange in the community takes place, the company of the city of Kindberg is to be considered a key stakeholder. In addition, the distribution of smart meters, which is already taking place in the community, is fundamental to the Energy Community model. The smart meters are installed by the grid operator. Although the electricity market has been liberalized and each household can choose its own energy supplier, the regional energy supplier also plays an important role in terms of security of supply.

For the integration of all forms of energy supply, it is important to include all other commercial energy producers in the region. For example, there are wind farms in the municipality, which are operated by private companies. Furthermore, there are a private investor, who builds a hydroelectric power plant and the operator of two local biomass power plants, which are relevant in the Energy Community in terms of sector coupling (power to heat).

Definition of stakeholders:

1. E-Werk Kindberg
2. 3 Windparks (75 MWp)
3. Hydroelectric power plant (planned 80 KWp)
4. Small hydropower plant
5. Biomass heating plant (350 KW + 1 MW)
6. PV systems

Roles of the stakeholders:

1. Provide energy
2. Grid operators (E-Werk Kindberg and Biomass heating plant)
3. Purchase of electricity from the Energy Community and possible storage solutions (Power2Heat) (Biomass heating plant)

5.5.2. Institutions, Organizations and Relevant Population Groups

Municipality of Stanz im Mürztal

The municipality is involved in several roles in this stakeholder analysis. First of all, it is the initiator of the local energy community, project partner of the Smart Rural 21 project and is an association member in the Renewable Energy Community Stanzertal. As a local authority under public law, it has certain administrative responsibilities for the population. In the group discussions, it was discussed what role the municipal office can play in the administration of the digital local currency and how this can be aligned with the Styrian municipal regulations on a legal basis.

Regarding the usability of the digital local currency, it was discussed to what extent municipal taxes such as municipal waste tax, etc. can be paid in Stanz Token in the future. The municipality also supports societies in the community and financial contributions for these organizations could also be paid in Stanz Token. In this way, the municipality can increase local value creation immensely. Another big topic will be the optimisation of the energy community through shifting power consumption, innovative storage options and even black-out prevention for the community. Here, the FFG project Stanz+ of the municipality plays an important role in the development of related technical infrastructures.

Roles of the stakeholder:

1. Territorial authority and administrative unit
2. Enabler and facilitator of the "Stanzer Way"
3. Initiator of the local energy transition
4. Public services for population
5. Member of the renewable Energy Community (Prosumer)

Association of the REC "EG Stanzertal”

The association "EG Stanzertal" is the responsible body of the renewable energy community but also plays a strong consultative role for interested citizens in the community. The conceptualization and acquisition of PV systems (whether for private purchase or in the form of citizen participation systems) is handled by the association. Furthermore, the “EG Stanzertal" is the intermediary between the grid operator and the members of the association. Together with the members, the association determines the price for the electricity, the underlying business models and also assumes the role of billing and administration of electricity purchases within the community. The association members are thereby divided into producers, prosumers and consumers. Prosumers and producers within the Energy Community can generate Stanz Tokens through the production of surplus electricity and circulate them through purchases in the region. It will also be possible to pay the membership fee of € 25 with the Stanz Token.

Roles of the stakeholder:

1. Governing body of the REC
2. Interim between energy supply companies and association members
3. Consultative activities in the area of technical infrastructures
4. Communication with regulatory authorities and relevant networks
5. Members divided into
    - producers
    - prosumers
    - consumers

Private households Stanz im Mürztal

Private households from Stanz play an important role for the energy community. They act as consumers and can become prosumers or producers of electricity by integrating or purchasing PV systems. They are thus the heart of local peer-to-peer electricity trading. People who are not members of the renewable energy community play a role when they use Stanz Token to pay at the local commercial businesses. Stanz Tokens can then be deployed, among other things, to pay municipal taxes, purchase goods and services in Stanz and thus increase regional value creation.

Definition of stakeholders:

1. Stanz has around 800 private households
2. Around 60 private households are now members of REC

Roles of the stakeholders:

1. Consumers
2. Producers
3. Prosumers
4. Customers for local businesses
5. Private investors

Farmers

In the rural Stanz im Mürztal, farmers play an important role in the “EG Stanzertal" and can become electricity producers and consumers. Due to the large amount of land and rooftops of buildings, they can also provide areas for PV participation plants. On many of the farms there are still old water mills which represent a great potential for energy production with small hydropower plants in the sense of the renewable Energy Community. The extent to which the necessary water usage rights still exist is currently being examined. Furthermore, farmers offer "agro tourism" and offer direct marketing of their farm products. In the future, direct sales could also be made with the Stanz Token and no longer only with the Euro. In addition, local retailers could remunerate their regional suppliers with Stanz Tokens.

Definition of the stakeholders:

1. According to the 2010 survey, there are 244 agricultural holdings in Stanz.
2. Of these, 56 were farms with at least one full-time job
3. It can be assumed that the number of farms has decreased since 2010

Roles of the stakeholders:

1. Purchase of electricity
2. Producers of electricity
3. Roofs and grasslands for possible large PV installations
4. Producers of regional goods
5. Partial Agri Tourism provider

Entrepreneurs

For businesses in Stanz, the consumption of electricity from the Energy Community and flexible electricity consumption with load shifting and thus cost savings will play a major role. Especially in times of high and further increasing energy prices, this is a significant cost factor for companies. In this way, an energy-efficient and resilient economy can be strengthened. By accepting the Stanz Token as a method of payment, business operators can be strengthened in terms of regional value creation. Discount campaigns for payment with Stanz Token could strongly incentivize payment with it. Municipal taxes and taxes of the local businesses can also be paid with the Stanz Token. An important requirement is a very good connection to the already existing accounting systems with their specific software and operating systems.

Definition of stakeholders:

1. Trixis Dorfladen operates the local supply with a focus on regional and organic products.
2. There are six gastronomy facilities in Stanz
3. There are 25 other businesses in Stanz

Roles of the stakeholders:

1. Purchase of electricity
2. Partial space for PV systems
3. Part of the local economy and thus of the possible local currency system

Operators of critical infrastructures

For critical infrastructures (gas station, grocery store, IT infrastructures, etc.), a self-sufficient energy supply is very important in the event of a blackout. In terms of the Energy Community, critical infrastructures could gain priority access to stored energy and thereby ensure basic supply.

Definition of stakeholders:

1. Medical care in the village
2. Municipal office
3. Food supply / Trixi's Dorfladen
4. Fire department

Roles of the stakeholders:

1. Are dependent on supply in the event of power failures (black-out)

Other associations

Associations and societies represent an essential pillar of social life in the municipality, perform important functions in the areas of sports, leisure, social and cultural activities and

have many members from the population. As already mentioned, societies receive an annual subsidy from the municipality. This or a share of this could be paid out in Stanz Tokens. The incentive could be a higher grant in Stanz Token. In this way, they buy even more in the village for their events and club festivities and would thus also increase the regional added value. Membership fees could also be paid with Stanz Tokens.

Definition of stakeholders:

1. There are around 30 associations in Stanz

Roles of the stakeholders:

1. Consume energy
2. Are important for social life in Stanz
3. Could be a leverage for the local currency via association funding

Non digitals

Non digitals are people who do not have a smartphone or do not want to download the wallet for other reasons. Nevertheless, it must be ensured that this group of people is not excluded from the Stanz Token. Therefore, it is necessary to create an analog counterpart to the Stanz Token and create an alternative billing model for the Energy Community. This in particular concerns people under 13 years of age and over 60 years of age.

Definition of stakeholders:

1. Older population (persons 60 and over)
2. Younger population (children up to 13)

Role of the stakeholders:

1. Are dependent on an analogue variant of the local currency
2. Workshops can be organised for these groups of people

Children / Youths

Children and young people from Stanz can become a crucial "role model" in terms of the Stanz Token and the regional energy transition. In the 1980s, schoolchildren played a key role in the successful roll-out of the "garbage separation" model in Austria. It is important that the energy transition is made visible and tangible for them through workshops. In this way, an understanding of sustainability and also of regional value creation can be learned in a playful way and passed onto future generations. They, too, become the supporters of the Stanz Token and could use it to receive their "pocket money", spend their expenses, receive gifts and, for example, buy their pizza at the kiosk at the lake with it.

Definition of stakeholders:

1. In 2021, around 200 people living in Stanz were between 5 and 19 years old
2. Around 60 children were of primary school age

Role of the stakeholders:

1. Stanz Token
   - acquiring goods and services
   - receiving gifts in the form of tokens (e.g. education fund)
2. Playful learning of the regional energy transition

Volunteers

Volunteering plays a central role in Stanz. Numerous initiatives from previous projects can be attributed to the voluntary commitment of the people of Stanz. In the meantime, between 80 and 100 volunteers have established themselves in Stanz and are working together on the "Stanzer Weg" - the inclusive and democratic community development process. Here, too, there could be social remunerations and remuneration for voluntary work. One of the initiatives is the e-taxi. This service could also be paid for with the Stanz Token, among other things. In addition, energy-efficient charging and shifting power consumption also play an essential role here.

Definition of stakeholders:

1. In Stanz, there are about 80 people who are voluntarily involved in community life besides existing associations.

Role of the stakeholders:

1. Possible remuneration / support though Stanz Token

5.5.3. Control Bodies and Funding Agencies and Institutions

Funding bodies and relevant expert networks

This stakeholder group is composed in particular of representatives from the province of Styria, the federal level in Austria and the European Union. In order to continue the innovative municipal development process, especially in the field of energy, Stanz im Mürztal is dependent on third-party funding. Furthermore, specialized networks (e.g. Smart Village and Smart Rural) and experts from various relevant fields play a central role. Stanz can benefit greatly from the exchange of experience, networking and the availability of public funds. Here it is particularly important to ensure integrated and networked work across all disciplines and projects - in line with the Smart Village strategy. For example, the topics of energy transition, Stanz Token, energy storage option, load shifting and social innovation are of particular importance. Therefore, experts are needed to support the projects with their know-how. The central focus is on the Stanzertal Energy Community.

Definition of stakeholders:

1. Grants and funding institutions at regional, national and European level
2. Universities and research institutions
3. Relevant research projects
4. Austrian Coordination Office for Energy Communities

Role of the stakeholders:

1. Financing of further R&D projects
2. Knowledge transfer
3. Dissemination of knowledge

Control Authorities

The legal framework plays a significant role in the development of the Stanz Token. Stanz im Mürztal must carry out its projects along all legal requirements and compliances. Here, the municipal supervision of the province of Styria and the financial market authority of Austria play a crucially important role in making such a project possible. During the conference it was discussed that Stanz im Mürztal could possibly become a sand-box framework so that pilot projects can be implemented in a secured framework in this area.

Definition of stakeholders:

1. Financial market control.
2. National bank
3. Tax Authority
4. Municipal Supervision Province of Styria

Role of the stakeholders:

1. Control compliance with legal requirements

6. Status quo of Stanz Ecosystem

Stanz im Mürztal is a small local community in Styria. Covering an area of approximately 8000ha (80% of which are forests), it has more than 1800 citizens living in 800 households. As a Rural Pioneers Community, Stanz is actively pursuing new ways to organize energy generation, distribution and consumption.

The focus of this project is to evaluate how existing initiatives in Stanz can be leveraged and integrated by blockchain technology. This happens in alignment with the vision of becoming energy independent as well as fostering regional value chains and increasing the share of local value added in the region.

As a first step, existing ecosystems within the Stanz that underlie a potential token economic system are described. Subsequently the foundation of potential token economic systems are analyzed.

6.1. Stanz Gutschein

The “Stanz Gutschein” (hereafter named Stanz voucher) is a voucher-based local currency that is issued by the municipality (“Gemeinde”), and can be used for payment of goods and services at local businesses. All major businesses (e.g. pubs, the local gas station, etc.) in Stanz accept the voucher.

Having been established some 15 years ago, it was relaunched in 2015/2016, in order to streamline administrative processes. However, the goal of the Stanz voucher remains the same. It is a tool that aims to strengthen the local economy and the support of local businesses.

On a yearly basis around 30-40 people are purchasers of the Stanz voucher. Buyers of the voucher are varied including private individuals, businesses and the community, buying on average EUR 50 to EUR 100 worth of vouchers in a single transaction. These buyers mainly use the voucher for gifting purposes (eg. as a gift for a birthday or at the company Christmas party). Recipients of these gifts can use the voucher at local businesses.

The voucher is accepted by all main businesses in the community Stanz im Mürztal. The acceptance of the voucher is officially limited to Stanz.

Between 2019 and 2021 the average amount outstanding was EUR 13.000. An increase in the amount outstanding was observed in this timeframe. This is due to the opening of a supermarket in the community where people can pay with the vouchers.

From a design perspective, the Stanz voucher is issued in increments of EUR 10 and there is no minimum or maximum purchase among. The voucher has a constant value, a serial number and no date of expiry. Transactions in the voucher (issuance, redemption, use) carry no transaction fees.

The vouchers are exclusively issued at the Gemeindeamt Stanz im Mürztal (local authority of Stanz im Mürztal). Buyers receive the vouchers by paying the nominal value in cash. From an administrative perspective, for each purchase transaction an invoice is issued containing the number of sold vouchers as well as their serial numbers.
Holders of the voucher can then use the voucher much like cash. When purchasing goods and services they simply hand over the voucher instead of cash.
Vouchers are normally returned to the municipality by local businesses. (a redemption by private individuals practically never occurs). When a voucher is returned, the holder of the voucher is reimbursed the nominal value of the vouchers in cash or via bank transfer. The vouchers are subsequently invalidated and the invalidation of the specific serial numbers recorded.
The information available points to a limited circulation of the voucher. Normally, after having bought the vouchers from the local authority, buyers gift the vouchers to private individuals, who use them at a business to buy goods and services. The business then returns the vouchers to the local authority. Normally, businesses redeem the vouchers after a certain amount of them has accumulated.

6.2. REC Stanzertal

The REC Stanzertal was incorporated as an association (Verein) in 2022 and currently has 60 members at the time of writing, with many more citizens interested in joining the REC. Members include prosumers, net-consumers as well as net-producers.
From an organizational perspective, the REC main tasks lie in the organization of the community, in the management of the infrastructure and the future development of the initiative. To this end the REC operates four working groups (PV, wind, small hydro power stations, communication) that drive the future development of the REC. It is not planned that the REC itself owns significant generation assets.

Vision and Goals

Within the bigger Stanz context the goals of the REC are not so much energy autarky but rather to foster the individual feeling of responsibility and the higher level of autonomy, while at the same time to strengthen the already existing feeling of community. In this sense, the vision for the REC is to increase the visibility of energy and energy consumption within the community and increase the engagement of citizens with this topic.
From a more practical perspective, participating consumers of the REC benefit from cheaper energy tariffs from the REC (see below). Additionally, existing prosumers in the Stanz area are able to feed in their surplus energy to the REC at beneficial rates.
From a more operational perspective, the REC Stanzertal aims to optimize its supply and demand to be as self-sufficient as possible. This means that in an ideal case electricity is

generated, stored and consumed mostly locally. Only a marginal part of the energy being supplied to or demanded from the local utility (E-Werk Kindberg). Various innovative ideas and sub-initiatives are pursued to reach this operational goal (e.g. use of E-vehicles as batteries, integration with local heating and cooling system, etc.)

Current Infrastructure and Initiatives

Local utility and local grid: From the perspective of the traditional electricity grid, E-Werk Kindberg is the relevant electric utility for Stanz im Mürztal. E-Werk Kindberg is responsible for balancing any supply and demand imbalances within the REC. Being tied to the utility, the geographic scope of the REC is not the municipal boundary of Stanz but rather the areas supplied by E-Werk Kindberg.

At the time of writing, the REC and the community of Stanz were in negotiation with E-Werk Kindberg for a special tariff for REC members ("Stanz Tarif"). This local tariff enables them to purchase energy from the utility at slightly reduced rates. This rate reduction is made possible by channeling the network subsidies for sustainable energy directly to consumers. Although the monetary benefits are only a light reduction in rates, from a social perspective the special rate for the region fosters the community feeling within Stanz.

Generation Facilities: Currently, the REC is building a PV-installation on top of the local primary school. For the future it is planned to integrate new as well as existing energy generation assets into the REC. These include smaller generation facilities owned by individuals (e.g. private, roof-top PV panels) as well as larger generation facilities owned by the community or investors (e.g. a small hydropower station and two biomass-plants (350 KW and 1 MW). Although there is a large wind farm with 75 mWp generation capacity in the region, this facility will not be included in the REC in the near future due to contractual obligations of the wind farm.

The addition of new generation facilities is dependent on general requirements for the new members of RECs[91] as well as future regulatory developments.

MyPower Platform: In connection with the planned PV generation facility installed on the rooftop of the primary school, Stanz evaluates a cooperation with Riddle & Code. Riddle & Code's Mypower Solution is a management system for the facility which enables the management of the data streams of the facility. The platform not only shows energy production but also can be used to create blockchain-based tokens based on the generated energy.

In addition, the platform can be used for the tokenization of the generation facility itself. Tokenizing the facility makes it possible to divide ownership of the facility into small shares. These can be bought by the general public. This way citizens can participate in production

[91] Appendix A, Decentralized energy supply through energy communities

facilities as investors without having to invest large amounts of money. The project is planned to go online in Q3/Q4 2022.
While MyPower Platform currently only encompasses the school PV installation, it can form a good basic infrastructure for a larger REC.

Other energy related projects: In accordance with the general aim to balance supply and demand within the REC, Stanz currently participates in a project to better match supply and demand. To this end, supply and demand patterns of selected local participants are established. By better matching supply and demand, the REC as a whole requires less peak capacity. Adding to this, interlinking electricity with other forms of energy (e.g. via. Electrical heat-pumps for heating) can further shave peak-demand.

7. Tokenizing the Stanz Ecosystem

The basis for designing a token economic system is a general understanding of the underlying ecosystem, its vision, its stakeholders and potential use cases. This enables the design and description of economic mechanisms and value flows. While the preceding section has focused on the underlying economic systems already in place, this section analyzes the potential system from a perspective of goals, stakeholders and use cases. Additionally, it discusses the general requirements that are needed for such a system.

7.1. Vision of the Token Economic System

The envisioned token economic system combines the best aspects of a REC using a blockchain-based infrastructure with a blockchain-based digital local currency. This would create a DLC based on energy. The field research and participation process showed that, generally, a DLC would be well accepted by various stakeholder groups in Stanz.

Creating such a shared infrastructure and DLC could lead to greater engagement of citizens in the project of the REC, increase the visibility of energy and energy consumption within the community, while at the same time fostering the local economy by strengthening the existing voucher-based DLC and create a stronger identification with Stanz.

The flexibility offered by blockchain would make it possible to add additional processes of the local economic system to the infrastructure and further support the local economy.

7.2. Stakeholders

For the purposes of designing token economic systems, all parties that affect the system or are affected by it need to be analyzed. It is important to note that this analysis takes the status quo of the underlying economic system as a starting point to ultimately show the potential participants in the system.

The parties to such a future token economic system can be either directly or indirectly involved with the system. Normally, stakeholder groups that are central to the development effort of the system are also at the core of the ecosystem (e.g. the municipality of Stanz, hereafter referred to as Gemeinde Stanz). Other direct stakeholder groups directly interact with the system.

This can be either in the development phase (e.g. suppliers of important system components) or in the daily running of the system (e.g. various user groups). Finally, indirect stakeholders have to be considered, although this type of stakeholders does not directly interact with or profit from the system. They can have considerable impact on the system by defining the bigger environment in which the system operates (e.g. regulators).

Name	Characteristics	Examples	Member of REC	Participant in the system
EG Stanzertal	# system initiator # association (Verein)		no (is REC and has no direct energy consumption)	yes
Gemeinde Stanz	# municipality		yes	yes
E-Werk Kindberg	# mid-size utility, infrastructure provider		no	no
Commercial Energy Producers	# larger operations focused on energy generation	#biomass plants (350 kWp+1mWp, mainly heating, private ownership) # hydropower plant (privately owned, planned capacity 80kWp # Windparks (privately owned, 70 mWp, contractual obligations)	potentially yes (subject to REC membership eligibility criteria)	potentially yes (subject to REC membership eligibility criteria)
Household (Prosumer)	# private household that has the possibility to act as prosumer (e.g. single family home)		potentially yes	yes
Household (Consumer)	# private household that doesn't have the possibility to act as prosumer (e.g. apartments, financial constraints)		potentially yes	yes
Associations, initiatives and voluntary work	# various associations (Vereine)	# Fire Brigade (FF Stanz im Mürztal) # Local associations (Vereine) # E-Taxi # AG Lebensqualität	potentially yes	yes
Individuals	# general public in Stanz	# youths/students	no	potentially yes
Local businesses (general)	# mostly SMEs	# due to different needs subcategorization might make sense: gastronomy, products & services # examples: Trixi's Dorfladen, local gas station etc. # a full list of businesses is available from Gemeinde Stanz	yes	yes
Local businesses (farmers)	# mostly SMEs		yes	yes
Contractors (various)	# companies that provide products and services to build energy-related assets	# Riddle & Code # Fladischer Elektrofachhandel	no	no
Regulators and supervisory bodies	# large organizations # public sector	# FMA # National Bank (OeNB) # Municipal Supervisory Board	no	no
Funding Agencies	# large organizations # public sector	# Energieagentur Steiermark # Federal funding Agencies (FFG Stanz+) # European Funding Agencies (e.g. Smart Rural)	no	no
Consultants & other service providers	# various	# Agentur Scan # Austrian Blockchain Center # CaliberCo # Tax consultant # Lawyer	no	no

Figure 7: Stakeholder Overview

Based on the results of the extensive field research and participation process, stakeholder groups were identified, described, and analyzed. In total 14 distinct stakeholders or stakeholder groups were identified and grouped into core, direct and indirect stakeholders.

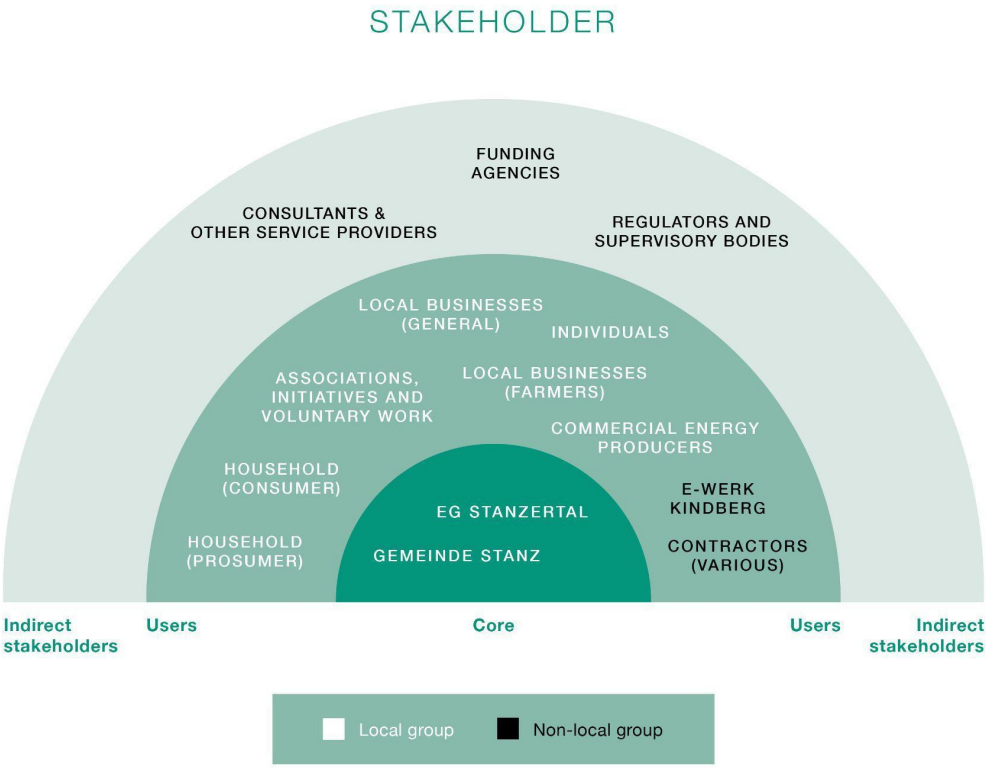


Figure 8: Stakeholder Map

Being driven by the REC Stanzertal and the Gemeinde Stanz, the system is largely catering to a diverse set of local user groups. These include households, businesses, local associations as well as the general public in Stanz. Non-local, direct stakeholders include the closest utility ("E-Werk Kindberg") which provides the connection to the public electricity grid. Furthermore, outside contractors can play an important role in providing crucial technical components to the system (e.g. Riddle & Code). Figure 8 (see above) gives an overview of all involved stakeholder and stakeholder groups.

When analyzing single stakeholder groups, it is important to consider whether they are expected to be members of the REC and whether or not they actively use the system (see figure 7[92]). Parties more deeply involved in the system by being a member of the REC and actively participating in the system, respectively, normally have stronger incentives and are

[92] A more detailed analysis of the roles can be found in the table in Appendix C, Stakeholders within the Token Economic System.

more active in the development process of the system. Therefore, these stakeholders should be actively addressed in the design process of the system.
However, this doesn't mean that other stakeholder groups should be neglected as they also play important roles for the success of the system. For instance, funding agencies provide project finance for the implementation of planned concepts without which an implementation would not be possible.

Name	Valuable Assets	Incentive	Value created
EG Stanzertal	# infrastructure management system # expertise # network # generation assets	# mission is to operate the system and foster sustainable energy	# operation of infrastructure # central party for all stakeholders involved # support of members with know-how and expertise
Gemeinde Stanz	# network # generation assets	# public mission # guardian of the Stanzer Weg	# initiator of DLC # central party for all stakeholders involved # potentially large token issuer
E-Werk Kindberg	# public grid	# legal obligation to provide service to REC	# load balancing between public grid and REC
Commercial Energy Producers	# mid to large scale generation facilities	# regular line of business	# significant energy provider within the community
Household (Prosumer)	# small scale generation facilities # know-how & practical experience	# financial reward via producing and selling energy # caring about sustainability # Stanz community feeling # strengthening the local economy	# generate energy for REC # use DLC
Household (Consumer)	n/a	# financial reward via reduced rates for energy # caring about sustainability # Stanz community feeling # strengthening the local economy	# consume energy from REC # use DLC
Associations, initiatives and voluntary work	# potentially buildings and other premises (e.g. football pitch, fire brigade house) # large member-network (good multiplier)	# increase of community feeling # increase of regional social life	# acceptance of DLC increases usefulness for DLC users # as recipients of DLC -based subsidies, important distributor of DLC
Individuals	# time	# caring about sustainability	# users of DLC # carriers of change and innovation
Local businesses (general)	# rooftop space	# cost savings via more efficient use of energy # cost savings via cheaper energy # DLC strengthens local economy and local value creation	# acceptance of DLC increases usefulness for DLC users # Depending on the business, add functionality to the infrastructure (e.g. storage, peak shaving, roof-tops)
Local businesses (farmers)	# large areas for potential installation of generation assets # potential for small hydro-electric facilities # rooftop space on business installation # biomass	# cost savings via more efficient use of energy # cost savings via cheaper energy # DLC strengthens local economy and local value creation # DLC as opportunity to increase direct farm sales	# can operate larger generation facilities # can provide assets for generation facilities # acceptance of DLC increases usefulness for DLC users
Contractors (various)	# products, services for specific problems # expertise	# regular line of business	# turn-key solutions (e.g. management software, installation of PV-modules # technical know-how
Regulators and supervisory bodies	# know how	# public mission (consumer protection, financial stability, public accounting etc.)	# prevention of misuse of public funds # consumer protection # financial stability # Create trust in supervised organizations and institutions
Funding Agencies	# know how # funds # network	# public mission (active contribution to energy transition # Reputation	# funding of high impact projects
Consultants & other service providers	# specialized know how and expertise in selected fields # network	# regular line of business	# analysis and understanding of system # prototypical implementation of system # evaluation of system (business, technological, regulatory)

Figure 9: Stakeholders - Assets, Incentives and Value Creation

Name	Producer	Consumer	Prosumer	Manager	Operator of critical infrastructure	User of token
EG Stanzertal	X (potentially)			X	X	potentially no
Gemeinde Stanz	potentially X	X	X (potentially)	X		X
E-Werk Kindberg						
Commercial Energy Producers	X	X (but low)	X	X (potentially)	X	X
Household (Prosumer)	X	X	X			X
Household (Consumer)		X				X
Associations, initiatives and voluntary work	X (potentially)	X	X (potentially)			X
Individuals						X
Local businesses (general)	X	X	X (potentially)		X (potentially)	X
Local businesses (farmers)	X	X	X			X
Contractors (various)						
Regulators and supervisory bodies						
Funding Agencies						
Consultants & other service providers						

Figure 10: Stakeholders – Roles within the Token Economic System

7.3. Creating, Using and Obtaining Tokens

Based on the stakeholder analysis, in a next step of the token engineering process the token flows are defined. There are two aspects of particular importance: a) the creation and destruction of tokens and b) the scenarios under which they are used during their lifetime.

Creation and destruction of tokens: An important consideration for any token economic system is the question of how tokens are created in the first place. The field research process as well as an analysis of the use cases identified several potential creation mechanisms. (see figures 9 and 10)

Use Cases	Description	Payor	Recipient	Characteristics
Production of Energy	- Tokens are automatically created for energy produced.	- System	- Prosumer, REC, (private) energy producer	- Point of token creation
Use of energy	- Token is used for the procurement of energy within the system. Tokens are automatically destroyed when the energy represented by the token is used.	- Users of Energy	- System	- Potential point of token destruction
Issuance	- Tokens are sold by Gemeinde Stanz against EUR	- Gemeinde Stanz	- All stakeholder groups (incl. businesses)	- Point of token creation
Redemptions	- Tokens are exchanged for EUR and subsequently destroyed or used by Gemeinde Stanz.	- All stakeholder groups (incl. businesses)	- Gemeinde Stanz	- Potential point of token destruction

Figure 11: Creation and Destruction of Tokens

Use Cases	Description	Payor	Recipient	Characteristics
Payment of subsidies to voluntary associations	- Gemeinde Stanz pays out part of existing subsidies in tokens	- Gemeinde Stanz	- Voluntary association	- Potential point of token creation
Payment of social subsidies for energy or heating	- Gemeinde Stanz pays out part of existing subsidies in tokens	- Gemeinde Stanz	- Individuals / Household	- Potential point of token creation
Payment of association membership fees	- Individuals pay membership fees of voluntary associations in tokens	- Individual	- Voluntary Association	-
Payment of municipal taxes	- Individuals as well as businesses pay (part) of the municipal taxes in tokens. - For an average household, municipal taxes are between EUR 1000 to 1500 p.a.	- Individuals, Businesses	- Gemeinde Stanz	-
Payments for goods and services	- Token holders can pay purchases of goods and services from businesses that accept Stanz token. These can include gastronomy, the supermarkets, the gas station or farms that directly sell their products to consumers.	- All stakeholder groups (incl. businesses)	- Businesses accepting tokens	- Loosely energy related (for gas station)
Payment of suppliers (excluding energy)	- Token is used by a business to pay its suppliers. Examples include the purchase of wood from farmers by the biomass plant or the payment of suppliers by Trixi's Dorfladen. - Most businesses in the Stanz region already accept the tokens. Further	- Businesses	- Businesses (incl. agricultural businesses) accepting tokens	-
Purchase of energy	- Tokens can be used to purchase energy. Depending on the implementation of the token economic system, energy trading can be P2P, P2B or centralized over the REC. While the purchase of energy doesn't necessary lead to the destruction of the token, the use of the underlying energy does.	- All stakeholder groups (incl. businesses)	- Prosumer, REC, (private) energy producer	- Energy related - Potential point of token destruction
Investments	- Tokens are used as an investment into renewable energy generation facilities	- All stakeholder groups (incl. businesses)	- REC	- Energy related
Gifting	- Tokens are used as a gift	- Businesses, Individuals, Gemeinde Stanz	- Individuals	-

Figure 12: Using Tokens

In summary, tokens could be created via the generation of energy and destroyed by using this energy. Implicitly this would base tokens on the amount of energy used (e.g. 1 token per kWh). Additionally, tokens could also be issued by a central party – like Gemeinde Stanz. In this case a token would be issued by "Gemeinde Stanz" in a transaction against Euro. This explicitly pegs the token to Euro.

Using tokens: The field research process also yielded several scenarios in which tokens can be used (see figure 12 above). Co-developing these use cases with members of the wider Stanz community, participants ensured their practical relevance for citizens. While the table implicitly focuses on the user or payor in the transaction, it must be emphasized that recipients of tokens in most cases become payors themselves, the next time they use the token.

The discussion of the use cases yields additional insights for the design of a token economic system.

- *Additional creation mechanisms*: The analysis of the use cases identified an additional creation mechanism. Tokens can be issued by Gemeinde Stanz under various programs (subsidy programs for voluntary associations, social subsidies etc.). In this case the token would be issued against a budget of Gemeinde Stanz. This implicitly pegs the token to Euro.
- *Payment function dominates*: Most use cases identified focus on the use of the tokens for payment purposes (ie. as a DLC). Only a few selected use cases are integral to the energy sector. This suggests basing the token on Euro.
- *Accounting system integration*: Any use case that involves at least one party that has accounting requirements, requires a token economic system to be integrated into the existing book-keeping system.
- *Voluntary Work:* Remuneration of individuals for voluntary work with tokens was initially considered as a use case. However, discussions showed that extrinsic motivators were seen as very critical for voluntary work. This is in line with extant scientific literature.[93] Additionally, the measurement of the remuneration is a potential source of conflicts.

The analysis also yields insights into which types of tokens could be potentially relevant for the system.

[93] cf. e.g. Ryan & Deci (2000)

- Utility token: Once purchased, utility tokens are stored in a crypto wallet. They are associated with the buyer and can be used to access services of a blockchain project. In the case of Stanz, energy tokens can act as utility tokens that are transferable, exchangeable and fungible for users to enable peer to peer energy trading within the energy community.
- Payment token: Payment tokens represent a certain value that can be used to purchase goods or services from persons other than the issuer. This can be based on tokens from peer-to-peer energy trading systems, where one energy token equals 1 kWh of energy generated. Alternatively it can also be based on a Euro denomination.
- Security token: Security tokens are very similar to traditional debt or equities. They give a right of payment against an issuer. In the case of Stanz security tokens could represent an ownership for photovoltaic systems. In this way it is also possible for individuals to participate in the energy community and own a share of the photovoltaic system without spending all the money that is needed for a whole photovoltaic system.

7.4. Other Functional and Non-functional Requirements

From the field research phase, several general functional as well as non-functional requirements emerged that should be considered when designing a blockchain-based system.

From a perspective of general functional requirements three requirements were identified that are important for potential users in Stanz.

- *Exchangeability:* There is a strong preference that any token should be exchangeable into Euro. Furthermore, tokens were not seen as an object of speculation. That means that there was a preference for a fixed exchange rate to Euro. Especially when tokens were considered for payment related use cases.
- *Analog option:* There were strong preferences that any digital system should have an analog option. This desire was partly due to the wish of making the system as inclusive as possible for people who are not digital natives. Another reason given, was the better look and feel of having and using physical representation of the token.
- *Accounting system integration:* An important functionality for businesses and, more generally, organizations that have to keep accounts, was the compatibility of the system with accounting systems.

From the perspective of non-functional requirements several features were identified that are of particular importance for potential users in Stanz. The requirements identified can be typically expected from any IT-system and included:

- *User friendliness:* From a user perspective, the participation should be as easy as possible. That includes easy to understand processes and well designed front-end components
- *Security:* System security and prevention of hacker attacks were an important aspect for potential users.
- *Local Participation only:* The field research showed that participants would prefer a system that is regionally limited to Stanz.

8. Concept for a Token Economic System

Based on the analysis in the preceding section, this section conceptualizes token economic systems for the existing economic systems. The ultimate goal of the analysis is to evaluate the feasibility of creating a DLC based on tokenized energy produced within the local REC. To this end this chapter drafts and analyzes, on the one hand, a token economic system optimized for the REC and, on the other hand, a system optimized for a DLC. This enables us to compare and analyze a potential integration of these two systems in a subsequent step.

8.1. The Stanz Energy Token as a Cornerstone of the REC

8.1.1. Basic Idea

The Stanz Energy Token rests on a simple principle. When members of the REC (i.e. producers or prosumers) generate energy and feed it into the local REC grid, a Stanz Energy Token is created. This token represents the energy generated (e.g. 1 token = 1 kWh). This process is automatically handled by the envisioned system via a trusted gateway that connects the generation facility to the blockchain system.

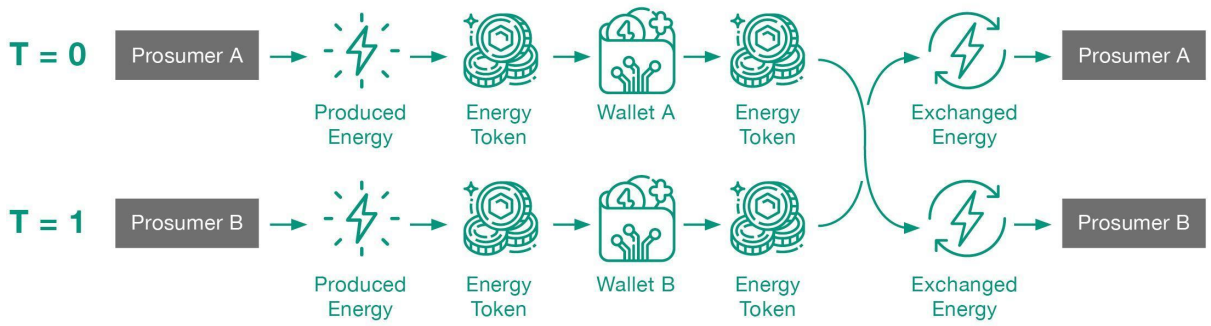


Figure 13: Stanz Energy Token - Basic principle

The holder of the token can then either use the energy (in which case the token is destroyed), or store it for later use, or sell it to other participants of the REC. The sale of Stanz Energy Tokens is handled in a peer-to-peer marketplace directly between sellers and buyers via the blockchain system. A consumer will ask for energy from a smart contract on the blockchain. The smart contract automatically checks if the requested amount of energy is currently available at one or more producers. If this is the case, it will fulfill the consumer's request. The remuneration for the token (and energy received) can be transferred in Euro in Stanz Energy Tokens. In the first case a fixed as well as a dynamically negotiated price is possible. This is an option for energy transfers between producers and consumers. In the second case, it is agreed that for every Stanz Energy Token received at a certain moment,

the buyer will return a token in the future. This is an option for two prosumers with energy needs at different times during the day (e.g. a household and a small business or school).

8.1.2. Token Types Involved

The Stanz Energy Token as described above mainly fulfills a utility function with certain payment aspects. Therefore, it can be assumed that it can be classified either as a utility token or a hybrid token. The Stanz Energy Token could be further developed into a DLC. For example, this could be done by giving prosumers and producers the possibility to pay municipal taxes with excess Stanz energy tokens. However, this would mean that the payment aspects of the token would be more dominant. This needs to be considered in any legal evaluation.

Although it is quite common for local currencies to have special features (e.g. decreasing value over time, redemption fees), the field research and participation process showed a strong preference for a simple, easy to understand design.

The objectives and needs of the energy system and its users are thus competing with this preference for simplicity. For example, users might prefer to store tokens generated in summer for later use in winter. This could lead to several problems (e.g. price differences for energy supplied by E-Werk Kindberg over time) and also counteract objectives of the REC (e.g. achieve load balancing within the REC). Therefore it seems advisable to introduce features that incentivise the immediate use of the Stanz Energy Token (e.g. decaying value, storage fee, pricing at the time of use etc.) It is recommended to simulate and test such features, in order to establish the exact impact on the system.

The Stanz Energy Token is a transactional token meant to represent energy and should not be confused with a token meant to represent ownership in a generation facility. An idea discussed during the field research and participation process was to enable participation in renewable energy facilities for little money. Tokenizing a generation facility into small shares, would make it possible to purchase only parts of an expensive facility. The type of token used in that case is a security token.

8.1.3. Technical Components

Infrastructure: Since the Stanz Energy Token acts as a token for low value transactions, low fees are the major factor for selecting an appropriate blockchain protocol to serve as the backbone infrastructure. Furthermore, stability, security, and energy efficiency should be deciding factors. Additionally, as it could become important for the future development of the system (e.g. cross-regional energy trade) blockchain interoperability should be considered. For the system at hand, it is recommended to focus on private blockchains. Nodes for the network can be established at key stakeholders in the community (e.g. Gemeinde Stanz, Commercial Energy Producers etc.). From a technical perspective these nodes could run on local computers or on cloud-based service.

Smart Contracts: A smart contract is basically a written code/computer program that is stored on a blockchain and runs when specific predetermined conditions are met.
From the required business logic that needs to be implemented in the system, the Stanz Energy Token system requires several smart contracts. First, a program for creating tokens based on the energy generated is needed. The system also requires a contract for destroying tokens once the energy is used. Both contracts need to be able to communicate with the energy infrastructure via a trusted gateway as an oracle. Additionally, contracts for the transfer of energy exchange are needed that match buyers and sellers and determine the transaction price. Lastly, a smart contract is needed to update the system when load balancing transactions with E-Werk Kindberg take place.

Wallets: Wallets allow users to hold and transfer digital assets. These wallets hold the private keys to access the digital asset held on the blockchain. There are various types of wallets that can be considered. So-called software wallets are applications running on a device of the user (e.g. smartphone). Hardware wallets are stand-alone devices that exclusively run the wallet software. Another important distinction is between custodial wallets and non-custodial wallets. Custodial wallets offer wallet services offered at a trusted third party. In contrast, non-custodial wallets are hosted by users themselves. While this gives users greater control over their wallets, it also means that if the wallet is lost or destroyed, or if the user forgets the access data to the wallet, the assets stored in the wallet become stranded.
Due to the high cost of hardware wallets, and the limited usability of non-custodial wallets, it is recommended that the Stanz Energy Token is based on custodial, software wallets.

User-side applications: Several user-side applications are required for the system. First, a smart phone app is required. The app should show users basic information about the status of their generation facility (e.g. output, tokens created etc.). It should also allow users to access their wallets in order to see their balance as well as initiate transactions. Lastly, it should enable users to set parameters for the automatic trading of surplus energy.
Second, businesses need a solution that can read transactional data from the blockchain system and translate it to a data format that can be processed by their accounting software. Third, for the manager of the ecosystem (i.e. REC Stanzertal) a backend solution is needed for documenting transactions, managing balances and periodic payments. Lastly, in order to make participants as well as non-participants more aware of the activities of the REC, a user-side front end showing the status of the whole system to the general public could be beneficial.

8.1.4. Governance

In the context of blockchain-based infrastructures, governance refers to the mechanisms for changing the rules of the system itself. There are two basic ways to implement these "change rules". So-called on-chain governance directly encodes the rules for changing the system into the system. In other words, the system is ruled by rules encoded in the system. This enables the automation and auto-execution of rules and in turn increases the predictability of the system. However, it also leads to inflexibility when unexpected situations arise. In contrast, so-called off-chain governance completely separates the rules for changing the system and places them outside the system.

For the system at hand, it is recommended that governance should be handled off-chain for two reasons. First, as an innovative project it is more likely than not that there will be an experimental phase in which different design variants have to be tested. Second, with the REC there already exists an organizational structure with established decision processes. It is therefore recommended to use this existing structure for government purposes. This also leaves open the possibility of migrating some governance rules on-chain at a later stage (e.g. voting processes of the REC).

8.2. The Stanz Voucher Token as a Digital Solution for the Stanz Gutschein

8.2.1. Basic Idea

The basic idea behind the Stanz Voucher Token is to digitalize the existing Stanz voucher (hereafter referred to as "Stanz Gutschein"). The basic processes underlying the Stanz Gutschein are not conceptually changed but rather put on a blockchain-based system. In this scenario, the municipality of Stanz creates Stanz Voucher Tokens which are transferred to the municipality's wallet and stored on the blockchain. The municipality of Stanz then is able to transfer the voucher tokens from the municipality's wallet to Stanz citizens. This transfer can have several underlying business cases. For example, the municipality can use the voucher tokens for existing transfer programs (e.g. subsidies to associations). As with the Stanz Gutschein today, it is also possible for citizens to buy the voucher token for cash.

Once holding voucher tokens in their wallets, owners can then use the token to purchase local goods and services.

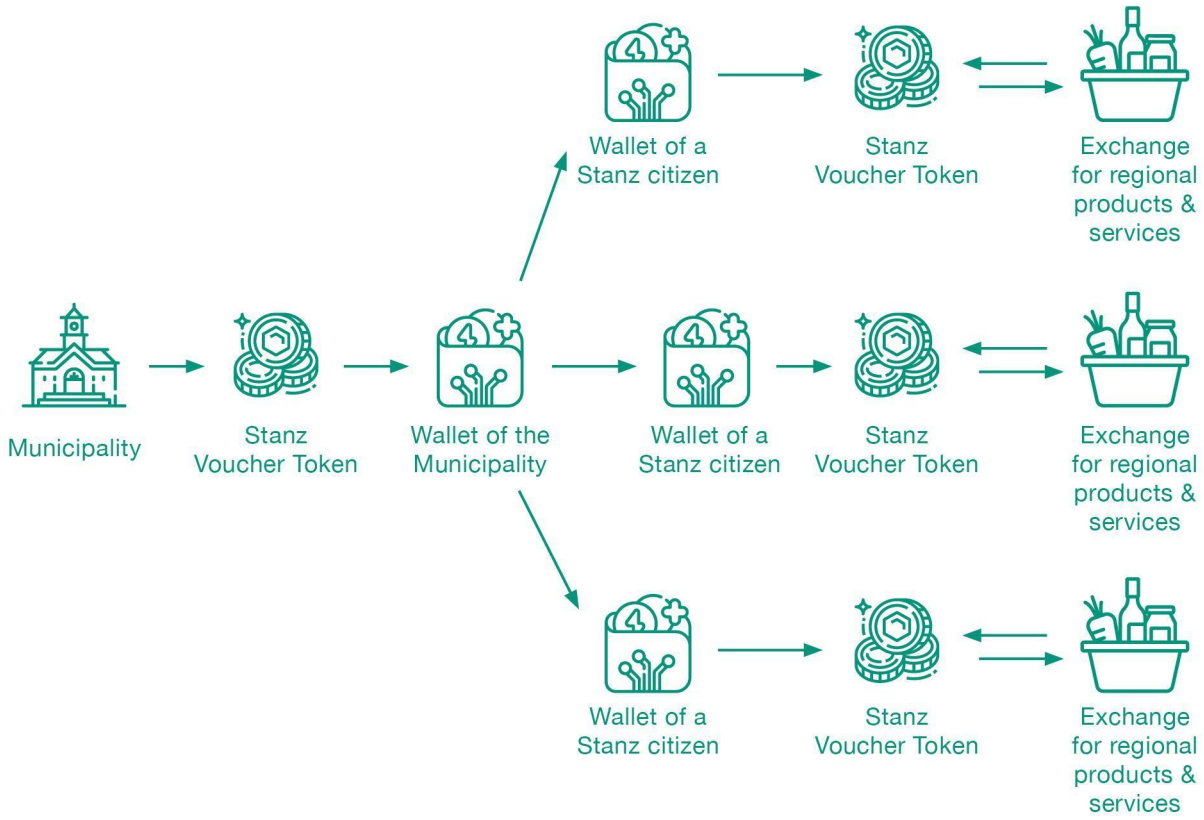


Figure 14: Stanz Voucher Token - Basic principle

8.2.2. Token Types Involved

The Stanz Voucher Token is a payment token. Payment tokens represent a certain value that can be used to purchase goods or services from persons other than the issuer. The Stanz voucher token acts as a payment token, because the only use case is to purchase goods or services.

Although it is quite common for local currencies to have special features (e.g. decreasing value over time, redemption fees), the field research and participation process showed a strong preference for a simple, easy to understand design.

Therefore, it is recommended to design the Stanz Voucher Token with as few special features as possible. More specifically it should

- represent Euro (e.g. 1 Stanz Voucher Token = 1 Euro)
- not decay over time
- not incur fees for obtaining or using it

One potential feature that could be advisable to introduce is some kind of hurdle with regards to the redemption of tokens. The impact of local currencies increases with an increased circulation of the local currency. The more often a local currency is used before being redeemed at the issuer the better. With the current system of the paper based Stanz Gutschein there are no cases of immediate redemption (e.g. some receiving the voucher as a gift, immediately exchanging it in at the municipality). One reason for this could be that cashing in comes at a cost (ie. going to the local authority). In a digital version of the Stanz Gutschein this cost is reduced to zero which could lead to not only immediate redemption but also high frequency redemptions of small sums.
In order to prevent this risk, some hurdle to redemption seems advisable. Possible solutions could be a minimum redemption amount (e.g. EUR 100) or a small redemption fee. The height of any redemption fee should be decided in comparison to other payment fees a redeemer has (e.g. credit card fees for merchants).

8.2.3. Technical Components

Infrastructure: Since the Stanz Voucher Token acts as a payment token, low fees, high transaction speeds, stability and security are the major key factors for choosing a technology. Due to the regional character of the Stanz Voucher Token blockchain, interoperability is of minor importance for technology selection. Overall, a private blockchain infrastructure is recommended, as this would satisfy the technical requirements of the system. Nodes for the network can be established at key stakeholders in the community (e.g. Gemeinde Stanz, larger businesses etc.). From a technical perspective these nodes could run on local computers or on cloud-based service.

Smart Contracts: From the required business logic that needs to be implemented in the system, the Stanz Voucher Token is rather simple, requiring only smart contracts for the creation and destruction of tokens.

Wallets: As with the Stanz Energy Voucher, in the setting of Stanz hosted custodial wallets are recommended, as this type of wallet combines an acceptable level of security with greatly increased usability.

User-side applications: Several user-side applications are required for the system. First, a smart phone app with basic payment functionality is required. The app should allow users to access their wallets in order to see their balance as well as initiate transactions. For a transaction the app would generate a QR-code that can be scanned by the recipient of the transfer. Working with QR-codes has the advantage that it can bridge the gap in a digital/non-digital transaction (e.g. a physical voucher that has the QR-code printed on it can be scanned by a transaction recipient with a smartphone). Second, businesses need a

solution that can read transactional data from the blockchain system and translate it to a data format that can be processed by their accounting software. Third, for the issuer of the tokens (i.e. Gemeinde Stanz) a simple backend solution is needed for creating and destroying tokens. This solution should also be compatible with existing accounting systems.

8.2.4. Governance

For the system at hand, it is recommended that governance should be handled off-chain by the municipality. Besides the added flexibility for experimenting in the initial stages of the project, this best reflects the existing governance structure of the “Stanz Gutschein”. This also leaves open the possibility of migrating some governance rules on-chain at a later stage.

8.3. Potential Merger of Energy and Voucher Tokens

Having described the Stanz Energy Voucher and the Stanz Token voucher in a preceding section, this chapter focuses on the comparison of these to token economic systems. This forms the basis for an evaluation whether a potential integration of these two into a system that creates a DLC based on the tokenized energy of the REC is feasible and advisable.

When analyzing the two systems some obvious differences stand out. For instance, the two systems use different mechanisms for the creation and destruction of the tokens. On the one hand, Stanz Voucher Tokens are centralized, issued by Gemeinde Stanz against Euro. This happens either via the sale of vouchers to the general public against cash or via issuing of vouchers to pay out subsidies currently payable in Euro. On the other hand, the Stanz Energy Token is generated in a decentralized manner, when producers of energy or prosumers generate renewable energy with the generation facilities. Additionally, there are differences in the technical set up of the systems (e.g. required smart contracts) and in the concrete implementation of the governance structures of the systems.
However, on a more fundamental level, there are two major differences between these two systems, namely, the goal structures and the value references.
The analysis shows that the goal structures of the Stanz Voucher Token and the Stanz Energy Token differ significantly.

From a systemic perspective, the ultimate goal of a DLC is to foster the regional economy by keeping value creation within a region. This is achieved by introducing a means of payment that is bound to a region. In order to foster this goal a main factor is a high circulation of the DLC. From an individual perspective, the main goal of the Stanz Voucher Token is to have an alternative means of payment which also fosters the local community.

In comparison the goals of the Stanz Energy Token are more complex. On a system level, there are several goals. First, the blockchain-based infrastructure is meant as a tool to document and manage energy flows within the REC. To this end, automation and a full digitization of processes is much more important than with the Stanz Voucher Token. Second, by enabling users of the system to take more responsibility for their energy usage, it also wants to increase the awareness of the general public for renewable energy and highlight the benefits of local energy production and consumption. Lastly, from a value exchange perspective, the token is primarily meant to be a means of exchange for energy. Ideally, a more transparent management of energy flows with a high involvement of users and the possibility to directly exchange energy between users, leads to a better balance of supply and demand within the REC over the longer term. Also from a user perspective, the goals for using the Stanz Energy Token are more complex. While financial goals such as cost savings and potential protection against inflation play a role, the more important considerations for using the system lie in non-financial goals such as optimizing the users own energy profile. This is done in order to achieve a higher level of autonomy and sustainability. In other words, especially for prosumers, selling surplus energy is an additional but secondary benefit.

Also, with regards to the value reference of the systems, fundamental differences stand out. The value reference of the Stanz Voucher Token is explicitly linked to the Euro. This value reference is long term and stable. In terms of a DLC, this makes sense as users intend to use it as a means of payments in lieu of Euro. As the field research and participation process has shown, there also is a strong preference for a simple design with a fixed exchange rate to Euro from users of a Stanz Voucher Token.

In contrast, the Stanz Energy Token is only indirectly linked to the Euro. The main reference unit is Kilowatt hours (kWh). This makes sense in relation to the system's goals of managing energy flows and making them more visible to users. However, although kWh can be priced in Euro, this pricing fluctuates over time, and for the system at hand ultimately depends on the tariffs obtainable from E-Werk Kindberg.

These fundamental differences make an integration of the two systems difficult. In addition, several practical issues for the system design have to be highlighted when considering an integration.
First, from the discussion of the two systems, it becomes apparent that one key operational goal when developing the Stanz Energy Token is the high grade of automation. This requires the system to be digitized to a large extent. In contrast, a DLC like the Stanz Voucher Token

aims to reach a high circulation as well as a high adoption rate in the population. This makes offering a physical version important.
Second, the legal implications of energy tokens as well as DLCs are fairly well understood. A combination of these two concepts would add legal uncertainty and would require a completely new legal evaluation and subsequent approval by the relevant regulators.
Lastly, another aspect that should be taken into account is that a combination of the systems will most likely decrease the flexibility for the future development of each system. The complexity of combining the systems at hand requires a tailor-made solution. This reduces the flexibility to add innovative functionality to the system at a later stage when compared to two less complex stand-alone systems. For example, from a regulatory perspective a DLC like the Stanz Voucher token rests on the assumption of regional use. A combined voucher and energy token would therefore most likely encounter limits for cross-regional energy exchanges between different RECs. This aspect is especially relevant as the Stanz Energy Token system currently is in a very early phase of development. Having been newly formed this year, REC Stanzertal is currently in the phase of organizing the association, building first generation assets and recruiting members. Many important strategic as well as operational questions are still under discussion.

Due to the issues outlined above an integration of the systems, while feasible, does not seem advisable at the current development stage of the REC.

9. Conclusion and Outlook

Before proceeding with the project, a decision on the scope and content of the future development needs to be made. Overall, there are several options for future initiatives.
First, it is possible to still focus on a co-development of Stanz Energy Token and Stanz Voucher Token. The discussion in the preceding section clearly shows that a co-development and integration of a fully functional DLC based on energy tokens created within an REC, adds large amounts of complexity to the design process and can lead to challenges due to competing goals, different fundamental design features and practical considerations. While certainly feasible, it doesn't seem advisable considering the current stage of development of both systems.

Another option lies in the parallel development of the Stanz Energy Token and the Stanz Voucher Token. While this is certainly possible, it is not recommended for two reasons. Developing two projects at the same time might strain existing resources in terms of financial as well as personal resources. Furthermore, system development requires making decisions on concrete technical implementations. Once these decisions are made, a certain lock-in is created, reducing the flexibility for a potential future integration of the two systems.

A third option is to focus on the development and implementation of one system. The project team recommends this option with a focus on the development of the Stanz Energy Token. There are several reasons for this. The analog version of the Stanz Voucher Token is a well-established system that is running smoothly with low overhead costs. As the analog version of the system will be continued in any case, a digitalization of this system is expected to add only marginal value. Especially, when considering the costs of system development. In contrast, the REC Stanzertal can immediately benefit from a flexible solution for documenting and managing the assets of the REC and its members.
With regards to the design, technical specification and implementation of the token economic system, it is recommended to follow established procedures. After having gained a clearer picture of the envisaged functioning of the system, next steps consist of a formal specification of the economy and the translation of business requirements into more formal language.

A formal, mathematical specification of the economy allows an analytical analysis as well as an analysis based on simulations. These types of analysis are important for complex, multi-stakeholder systems. Normally, in such systems unexpected behavior emerges leading to unexpected system states. Simulations can help discover and counteract such aberrations. Also, systemwide behavior can be shown and analyzed.

In addition to these analytical aspects, a translation of the business logic of the system into more formal, technical requirements forms the basis for the actual implementation of the system. This includes decision on and prioritization of concrete functional requirements of the system as well as detailed non-functional requirements for the system. Based on this work a first prototype with core functionality can be implemented.

It is strongly recommended that this work has a very narrow focus (e.g. energy flows in connection with the PV-installation on the roof of the primary school) in order to make fast progress and increase learning rates. Once a limited prototypical system is established and deployed this can form the basis for adding further functionality. Furthermore, a system with limited scope can be used to experiment with different mechanism design, parameter values of the system and policy choices without having a negative impact on the larger community in Stanz.

Parallel to the technical design of the system described above, conversations with relevant parties from the legal field should be started. This includes lawyers for a legal evaluation of the system and a translation into concrete legal questions. These questions can be used to initiate a dialogue with relevant regulators such as the Austrian Financial Market Authority (FMA) for information purposes.

Needless to say, the communication with the general public in Stanz is crucial for the adoption and therefore success of the project. Generally, the communication with regards to the project has been exceptionally good. One additional improvement could be to create a dedicated webspace for interested parties to access as well as store information relevant to the project at hand and the topic of sustainable energy in general. This would give the citizens of Stanz an additional touch point and enable everyone to actively participate in the energy transition process.

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10. Overview of Figures

Appendix A: Legal Considerations

Disclaimer

New types of legal questions arise in connection with blockchain applications. These legal questions have not yet been sufficiently researched from a scientific point of view and are not available for a final evaluation due to the lack of case law. Therefore, we do not assume any liability for the correctness of the legal statements.

The following statements do not constitute legal advice and/or legal clarification and do not replace legal advice. Instead, they are to be understood as an analysis of the given legal situation as well as possible legal consequences with regard to individual legal research questions. This document is intended for internal use only and may not, in particular, be used for submission to administrative authorities and/or courts. Any - even partial - disclosure to third parties is expressly prohibited.

Regional Currencies

a. Legal qualification of the regional currency

Regional currencies generally have the same functions as money. They serve as a medium of exchange, unit of account and store of value. However, regional currencies **do not qualify as legal tender**, but are based on an **individual contractual basis**.[1]

This results in the following limitations:

- **Regional limitation:** The validity as well as their usability as a payment instrument are typically geographically limited.[2]
- **Voluntary participation:** Another restriction is the (merely) voluntary participation of the issuing persons (e.g. entrepreneurs) and the redeeming persons (e.g. customers) in the regional currency system. Therefore, there is no general (acceptance) obligation, especially for entrepreneurs within the region concerned.). Therefore, there is no general acceptance obligation, especially for entrepreneurs within the region concerned.[3]
- **Period of validity and counterfeit-proofing:** Regional currencies also have an expiry date. They must be regularly renewed during their period of validity in order not to lose their validity and function as a means of payment prematurely. The notes must also be protected against counterfeiting.[4]

Due to the limitations outlined above, regional currencies **are not money** in the legal sense.[5]

From a civil law perspective, regional currencies are typically to be **qualified as vouchers**.[6] Their characteristic features are that, firstly, they are issued by a certain entrepreneur and, secondly, they entitle the customer to choose goods from the range of products of this entrepreneur up to the maximum amount of the voucher's nominal value. A special aspect is that the validity of such a voucher goes beyond the two-person

relationship between the entrepreneur and the customer. The regional currency in the form of a voucher is issued **by a central body** in the region (e.g. municipality), but can be **redeemed at several entrepreneurs**. However, the entrepreneurs must **explicitly agree** to this process in advance. This multi-personal relationship does not change the legal qualification as a voucher.[7] Since the characteristics described above are also present in a virtual regional currency, the comparison to (digital) vouchers can also be made here.

b. Civil law aspects

An independent **legal framework for vouchers does not exist in Austria**.[8] The contractual basis must be derived from the law of obligations, whereby the specific arrangement in the individual case must be taken into account.[9] In the following, the aspects of civil law shall be outlined.

- **Main contract of the voucher**: The legal practice unanimously assumes that the actual main contract is already concluded with the purchase of the voucher.[10] The redemption of the voucher therefore only concerns the execution of the legal transaction.[11] The legal nature of the main contract (e.g. contract of sale or contract for work and services) is the only decisive factor, therefore there are no delimitation problems.[12] Unless a limitation is imposed on the purchase of the voucher, the voucher holder can choose from the entire range of products of the entrepreneur.[13]

- **No restriction of consumer rights**: The redemption of a voucher does not limit the rights of a consumer in any way. For example, the consumer is entitled to the statutory warranty claims.[14]

- **Refund claim**: A refund of the amount stated in the voucher is generally not considered. However, a full exclusion of the right of withdrawal and exchange in the General Terms and Conditions is not permitted when vouchers are sold via an online platform.[15] Accordingly, a clause that excludes a revocation[16] of the consumer after redemption of the voucher in a general way violates the 14-day right of withdrawal in distance selling.[17]

- **Claim to redemption**: In general, there is no claim to redemption of the voucher in cash or to cash refund of the voucher. This would only be permissible with an explicit agreement with the entrepreneur concerned. If the sales price of the products is lower than the nominal value of the voucher, the entrepreneur will usually issue a new voucher for the remaining amount.[18]

- **Statute of limitations**: The period of limitations is 30 years according to § 1478 Austrian Civil Code (*ABGB*), unless otherwise agreed between the entrepreneur and the customer. In contrast, the Austrian Supreme Court (*OGH*) ruled that a validity period of only one or two years was grossly disadvantageous in the sense of § 879 para 3 Austrian Civil Code and ultimately inadmissible.[19]

In addition to the civil law aspects, data protection law (especially regarding the storage of customer data), tax law (see below under c) and regulatory aspects (see below under III) should also be taken into account.

c. Tax law aspects

With the adoption of the Voucher Directive[20] in 2019, the VAT treatment of vouchers was standardised in the EU. This directive introduced a definition of the term "voucher" for the first time (Art 30a no 1 Directive on the VAT system[21]) and subsequently made a distinction between single-purpose and multi-purpose vouchers (Art 30a no 2 and 3 Directive on the VAT system). The allocation of a voucher to one or the other category ultimately results in a different assessment of when the tax liability arises and becomes chargeable. In the case of a single-purpose voucher, the performance of the service is already fictitious at the time of issuance and thus immediately triggers VAT. In the case of a multi-purpose voucher, however, the VAT liability only arises when the service is actually performed at a later date.

Regional currency can also be treated like a voucher from a tax perspective.[22] In the present case, a multi-purpose voucher can be assumed, since at the time the voucher is issued, the place of the supply or other service and the tax liability have not yet been determined. The VAT liability does not arise when the voucher is handed over, but only when the service is actually rendered. Any onward transfers are not subject to VAT. If the service is provided by a third party, VAT is due for all identifiable services, whereby the Voucher Directive explicitly mentions distribution and promotion services (Art 30b para 2 Directive on the VAT system).[23]

d. Authorisation to implement a regional currency

§ 4 para 2 National Bank Act (*Nationalbankgesetz – NBG*) stipulates that the Austrian National Bank (*Österreichische Nationalbank – OeNB*) has the **exclusive right to issue banknotes**. In the case of regional currencies, there is no infringement of the monetary monopoly, as they are not legal tender and usually are used **in addition to the Euro**. However, if the concept of the regional currency is to replace rather than complement the Euro in the region concerned, there may be an infringement under certain circumstances. This is particularly the case if it is not possible to exchange the regional currency back into Euro. The implementation of the regional currency in a comparatively large area, where it is to be used predominantly instead of the Euro, could also appear problematic with regard to § 4 para 2 National Bank Act.[24]

These arguments, however, do not apply to the case at hand, as the regional currency is only to be introduced in a limited area and is in no way intended to replace the Euro as legal tender. The implementation of the regional currency therefore does not seem to be problematic. However, whether there can be restrictions from a supervisory law perspective due to potential concession obligations (E-Money Act 2010) is to be clarified under III.

[1] See *Frießnegger*, Einführung einer Regionalwährung, RFG 2012, 136 (138 et seq).

[2] See *Frießnegger*, RFG 2012, 138; regulatory exemptions may be relevant due of this.

[3] See *Frießnegger*, RFG 2012, 138.

[4] See *Frießnegger*, RFG 2012, 140.

[5] See *Frießnegger*, RFG 2012, 138; FMA Letter 01/2020: „*Begrenzte Netze - Anzeigepflicht gem § 3 Abs 4 ZaDiG 2018*“, 18, available under <https://www.fma.gv.at/fma/fma-rundschreiben/> (last requested on May 25, 2022).

[6] See *Frießnegger*, RFG 2012, 138.

[7] See *Frießnegger*, RFG 2012, 138; FMA Letter 01/2020, 18.

[8] Cf § 4 Discount Act (*Rabattgesetz*, but already repealed by Federal Law Gazette 1992/147).

[9] *Rastegar/Jenny*, Der Gutscheinvertrag I, VbR 2021, 123 (123).

[10] Vgl *Eccher*, Zur Rechtsnatur der Gutscheine, ÖJZ 1974, 337; *Spitzer/Told* in Schwimann/Kodek, ABGB VI[5] (2021) § 1053 ABGB Ref 27; *Verschraegen* in Kletečka/Schauer, ABGB-ON[1.08] (2020) § 1053 Ref 33; OGH 4 Ob 310/80; 6 Ob 191/04p = ecolex 2005/274 (*Wilhelm*); RIS-Justiz RS0072106.

[11] *Eccher*, ÖJZ 1974, 340; *Aichberger-Beig* in Klang[3] § 906 Ref 16; OGH 4 Ob 310/80; 4 Ob 416/81 = JBl 1982, 488 (*Eccher*).

[12] *Schwartze* in Klang[3] § 1053 Ref 67; see also *Dienst/Scheibenpflug*, JurPC Web-Dok 147/2012 Abs 24.

[13] See *Kolmasch* in Schwimann/Kodek, ABGB Va[5] § 906 ABGB Ref 5; see also OGH 6 Ob 126/74.

[14] *Frießnegger*, RFG 2012, 138.

[15] OGH 6 Ob 169/15v = VbR 2016/22.

[16] That is a return of the voucher to the issuer against reimbursement of the purchase price.

[17] § 11 para 1 Distance Selling Act (*Fern- und Auswärtsgeschäfte-Gesetz – FAGG*). The provision does not contain an exception for cases where a voucher is sold. Although a waiver of the right of withdrawal for services pursuant to § 18 para 1 no 1 FAGG is possible under certain conditions, according to the Austrian Surpreme Court the sale of a voucher is not always to be qualified as such a service. Rather, it should be classified according to whether the transaction to which the voucher refers is a purchase or service contract.

[18] *Frießnegger*, RFG 2012, 138.

[19] See both in relation to vouchers for tourist services in OGH 6 Ob 210/17a and OGH 7 Ob 22/12d; *Stadler/Pfeil*, Ungültige Befristung der Gültigkeitsdauer von entgeltlichen Gutscheinen, ecolex 2019, 852 (852 et seq).

[20] 2016/1065/EU.

[21] 2006/112/EC.

[22] *Frießnegger*, RFG 2012, 140.

[23] See *Geringer*, Neuerungen in der umsatzsteuerlichen Behandlung von Gutscheinen, taxlex 2019, 215.

[24] *Frießnegger*, RFG 2012, 138 et seq.

Decentralized energy supply through energy communities

a. „Decentralized Energy“

Due to the high degree of regulation in the energy industry and the dependence of the economic success of corresponding decentralized business models on regulatory framework conditions, the European legislator has created specific regulatory instruments to facilitate the emergence of decentralized supply structures. These instruments were incorporated into the Austrian legal system by the national legislator and elevated to the rank of legally recognised energy industry actors.

b. Different forms of energy communities

With the Renewable Energy Expansion Act Package[1], which came into force in 2021, the legislator added two further forms of energy community to the previously exclusive "energy community" (= the community generating plant). The following models of an energy community are now provided for by law:

- Community generating installations (*Gemeinschaftliche Erzeugungsanlagen – GEA*) pursuant to § 16a of the Electricity Industry and Organisation Act 2010[2] (hereinafter: *ElWOG*);
- Citizen Energy Communities (*Bürgerenergiegemeinschaften – BEG*) pursuant to § 16b ElWOG; and
- Renewable Energy Communities (*Erneuerbare-Energie-Gemeinschaften – EEG*) pursuant to § 16c ElWOG and §§ 79 et seq of the Renewable Energy Expansion Act (hereinafter: *EAG*).

Since the Renewable Energy Expansion Act Package is still very new and there is no case law on the new energy communities, the questions on delimitation, differentiation as well as commonalities cannot yet be fully answered. In individual cases, a separate examination of the permissibility of the concretely planned model is therefore indispensable.[3] In the following, however, the focus will be specifically on the renewable energy community (hereinafter: *REC*).

c. Renewable Energy Communities

i. Legal basis

The legal basis for the REC at European level is Art 22 of the Renewable Energy Directive ("RED II")[4] of 11. December. 2018. This provision was implemented at national level in § 16c ElWOG as well as in §§ 79 et seq EAG.

ii. General and purpose

Pursuant to § 79 para 1 EAG, an REC[5] may produce energy from renewable sources, consume its own energy, store it or sell it (especially to members). Furthermore, it may be active in the field of aggregation and provide other energy services. The rights and obligations of the participating grid users, in particular the free choice of suppliers, remain unaffected. Grid operation is permitted (§ 16c para 2 ElWOG).

The institute of the REC serves the purpose of advancing the production of renewable energy and self-sufficiency by creating the possibility for private individuals and other actors to join together to form a RECs across property boundaries. The energy produced in the own plants by the RECs is to be used thereby again together. In contrast to Citizen Energy Communities, RECs are allowed to operate not only in the electricity sector but also other energy related sectors such as heating and cooling. However, they are limited to the renewable energy sector.[6] The REC is thus a regulatory instrument not only to facilitate decentralized local, but also sustainable energy supply.[7]

However, the main purpose of the REC **may not be financial gain** pursuant to § 79 para 2 EAG. This must be stated in the articles of association if it is not already apparent from the form of the company. The REC shall primarily bring **ecological, economic or social community benefits** to its members or to the areas in which it is active.[8]

iii. Requirements under organizational law

Pursuant to § 79 para 2 EAG, a REC shall consist of two or more members or partners and shall be organized as an association, cooperative, partnership or corporation or similar association with legal personality.

Members or shareholders of a REC may be natural persons, municipalities, legal entities of public authorities in relation to local services and other legal entities under public law or small and medium-sized enterprises (SMEs). It is unclear whether only the direct participant must be an SME, or whether its shareholder or the group must be included.[9]

Participation in a REC is voluntary and open, but in the case of private companies, participation must not be their main commercial or professional activity. The involvement of a company founded purely for the purpose of participation is thus probably inadmissible. Pursuant to § 16c para 1 ElWOG, however, it must be noted that generators that supply energy to a grid in the local or regional area pursuant to para 2 leg cit may only participate in a REC if they are not controlled by a utility, supplier or electricity trader within the meaning of ElWOG. Whether and when subsidiaries and associated companies of other generators, suppliers or electricity traders may participate in the REC is not clearly regulated. The preconditions for participation must be examined in detail in the case in question.[10]

iv. Local delimitation

Within a REC, pursuant to § 16c para 2 ElWOG, the consumption installations of the members or shareholders must be connected to the generation installations via a low-voltage distribution grid and the low-voltage part of the transformer station (local area) or via the medium-voltage grid and the medium-voltage busbar in the transformer station (regional area) in the concession area of a grid operator. This represents a close connection ("*Nähekriterium*")[11] to the consumers and is at the same time the starting point for the privileged treatment of REC in terms of grid usage charges (see below). Accordingly, a distinction is made between local and regional REC.

v. Advantages

The "local tariff"[12] for grid fees pursuant to § 52 para 2 ElWOG is charged for purchases from the REC operator by the REC participants. This results from the mentioned "*Nähekriterium*" of the REC. The consumption installations are connected to the generation installations either in the local area or in the regional area in the concession area of a grid operator. Depending on this, the local or regional tariff is applied.[13] REC-participants do not have to pay either the Renewable Energy Contribution[14] or the Green Gas Contribution[15] for the energy they purchase (cf § 75 para 5, § 76 para 5 EAG). Electricity deliveries to REC participants from PV systems are generally exempt from the electricity levy.[16] Electricity that is generated but not consumed within a REC can be subsidized by market premiums up to a maximum of 50 % of the total amount of electricity generated within a REC pursuant to § 80 para 2 EAG.[17] However, in accordance with § 16b para 5 ElWOG, no market premium is granted for the electricity consumed by the members or the community.

vi. Ownership and power of disposition

Owners of generation facilities may be the community itself, its members or third parties. The power to operate and dispose of these generation plants must in principle (i.e. with the exception of self-consumption by members, so-called "prosumers") accrue to the community itself. The operation and maintenance of the generation plants can, in turn, be taken over by third parties (e.g. energy supply companies). Contracting and leasing models are also permissible.[18]

vii. Miscellaneous provisions

§§ 16d and 16e ElWOG contain further provisions that apply to energy communities in general.

- § 16d para 1 ElWOG: Grid users have a **legal claim against grid operators to participate in an energy community**.
- In addition, para 2 *leg cit* regulates **information obligations** of the grid operator, which he has to communicate to the regulatory authority (e.g. information on the description of the functioning of the generating installations; consumption installations of the grid users; the non-material share of the grid users in the generating installation as well as the distribution of the generated energy; allocation of the non-consumed energy feed-in per quarter hour; admission and withdrawal of participating grid users; termination or cancellation of the renewable energy community as well as the dismantling of the generating installations). Furthermore, he shall establish agreements on data processing, liability, bearing of costs and insurances.
- § 16e ElWOG: The grid operator shall **measure the supply of the consumption installations** of the grid users as well as the feed-in and the supply of the generation

installations with suitable measuring devices. The measured values of the generation plants and the consumption installations of the grid users shall be made available to the suppliers and the Energy Community as soon as possible. These values shall also be made available free of charge via a web portal.

d. Challenges and approaches to solutions for municipal actors

Besides issues of private law (e.g. property, contract and company law structures in the internal relations of a REC)[19] and questions of equality law (e.g. admissibility of privileges for communities founded as independent legal entities)[20], two main problem areas become apparent from the perspective of energy industry law. These concern the restrictive **requirements under organizational law** and the **prohibition of profit-making**.[21]

· **Organizational structure**: Pursuant to § 79 para 2 EAG, only small and medium-sized enterprises (SMEs) may participate in a REC in addition to natural persons, municipalities, legal entities of public authorities in relation to local services and other legal entities under public law. This would largely exclude the participation of municipal companies (e.g. so called *Stadtwerke-GmbH*), as these are no longer to be considered SMEs if the public sector holds more than 25 % of the company shares or voting rights.[22] In addition, (municipal) companies that exceed a certain number of employees and/or financial thresholds should also be excluded.[23] The (shareholding) status of municipal enterprises would thus be subject to a high degree of uncertainty.[24] As already described, a municipal enterprise classified as a supplier would not be allowed to participate at all due to §§ 79 para 2 EAG icw 16c para 1 ElWOG.

As an approach to a solution, the literature calls for a restrictive interpretation of the limiting requirements for municipal economic actors under the guiding idea of a specific member and/or local reference of the community activity.[25] Municipal (i.e. public) enterprises are obliged by constitutional law to serve the **local common good**.[26] In principle, they must pursue public service objectives in the local community. The fact that they may also operate for profit does not essentially change their public interest orientation. Accordingly, it would be advisable to allow the (controlling) participation of a municipal enterprise in a REC under a teleologically restrictive interpretation of the SME definition in the relevant Commission Recommendation or the provisions mentioned in §§ 79 para 2 EAG icw 16c para 1 ElWOG by way of exception. This also applies irrespective of the degree of participation of the state and the number of employees and financial thresholds of Art 2 annex (COM) 2003/361/EC. The fact that a municipal enterprise acts primarily in the service interest of the local community and thus complies with the regulatory purpose of the EC is constitutionally guaranteed.[27]

· **Prohibition of profit-making**: If a municipality or a municipal enterprise participates in a REC that not only generates electricity for its members' own consumption, but mainly sells it to **third parties** and thus markets it, such a REC

would in itself be classified as a **profit-oriented community**. However, if the sale is made exclusively in that municipality, it would (arguably) comply with the legal model of a decentralized energy supply worthy of support, which is committed to local electricity supply, due to its **specific local reference**. A profit orientation would therefore be denied.[28]

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[1] *Erneuerbaren-Ausbau-Gesetz – EAG*, Federal Law Gazette I 2021/150.

[2] *Elektrizitätswirtschafts- und -organisationsgesetz 2010 – ElWOG*, Federal Law Gazette I 2010/110 as amended by Federal Law Gazette I 2022/7.

[3] See for differences and similarities *Katalan/Reitinger*/Lejsek, How To - Energiegemeinschaften: Ein Überblick, RFG 2021, 184 (184 et seq).

[4] 2018/2001(EU.

[5] See also the definition in Art 2 No 16 of RED II.

[6] Rec 65 et seq Renewable Energies Directive.

[7] *Krönke/Tschachler*, RdU 2021, 254.

[8] See also Art 2 no 16 of the Renewable Energies Directive; more details on the advantages of a REC at <https://energiegemeinschaften.gv.at/vorteile-von-energiegemeinschaften/> (last requested on March 9, 2022).

[9] See *Katalan/Reitinger*/Lejsek, RFG 2021, 185.

[10] *Katalan/Reitinger*/Lejsek, RFG 2021, 185.

[11] See *Katalan/Reitinger*/Lejsek, RFG 2021, 185.

[12] This is a proportionally reduced network tariff for shared use of the public network within REC.

[13] The corresponding amendments to the System Charges Ordinance 2018 ("*Systemnutzungsentgelte-Verordnung 2018" - SNE-V 2018 - Novelle 2022*) regulating local tariffs entered into force on January 1, 2022, Federal Law Gazette II 2021/558.

[14] Pursuant to § 5 no 15 EAG, the contribution to be paid by all final consumers connected to the public electricity grid and which serves to raise a share of the subsidies.

[15] Pursuant to § 5 no 26 EAG, the contribution to be paid by all end consumers connected to the public gas grid, which serves to raise a share of the subsidies and to cover the expenses of the Service Agency for Renewable Gases.

[16] See § 2 no 4 ElAbgG; see also the Austrian Coordination Office for Energy Communities (*Österreichische Koordinationsstelle für Energiegemeinschaften – ÖKEG*), see <https://energiegemeinschaften.gv.at/vorteile-von-energiegemeinschaften/> (last requested on March 9, 2022).

[17] Regulations on funding are generally found in § 80 EAG.

[18] See *Katalan/Reitinger*/Lejsek, RFG 2021, 186.

[19] Cf *Cejka*, Privatrechtliche Aspekte der österreichischen Umsetzung von Energiegemeinschaften im EAG-Paket, ecolex 2021, 11 (13 et seq); *Hartlieb/Kitzmüller*, Erneuerbare-Energie-Gemeinschaften: Zivilrechtliche Stolpersteine und regulatorische Rahmenbedingungen, RdU-U&T 2021, 56 (56 et seq).

[20] Cf on this question *Rajal/Orator-Saghy*, Die Rolle der Energiegemeinschaften im österreichischen Energierecht, NR 2021, 34 (35 f). Nach *Krönke/Tschachler*, RdU 2021, footn 51 The linking of the

privileges to an establishment as a separate legal entity is likely to be permissible because the regulatory authority has an accessible object of supervision at its disposal.

[21] See *Krönke/Tschachler*, RdU 2021, 256.

[22] See Art 3 para 4 annex (COM) 2003/361/EC.

[23] See Art 2 annex (COM) 2003/361/EC.

[24] *Krönke/Tschachler*, RdU 2021, 254 et seq.

[25] Cf *Krönke/Tschachler*, RdU 2021, 257.

[26] See Art 118 para 4 Federal Constitutional Act (*Bundesverfassungsgesetz – B-VG*).

[27] See *Krönke/Tschachler*, RdU 2021, 257.

[28] See *Krönke/Tschachler*, RdU 2021, 257.

Token-based systems from a supervisory law perspective

a. Classification of tokens and regulatory framework

Due to the numerous design possibilities of tokens, several legal regulations may be relevant when issuing new tokens. In addition to the consumer protection regime, there are stricter regulatory measures in capital market and supervisory law.[1] However, the applicability of these regulations does not depend on the technological design, but on the **purpose and function** of the tokens.

There are different approaches to the classification of tokens in the literature and there are also certain discrepancies in the international context,[2] but the classification made by the Austrian Financial Markets Authority (**FMA**) appears reasonable from an initial point of view:[3]

- Security Token
- Payment Token
- Utility Token

Each token type fulfils certain criteria in terms of content (see below). In addition, mixed forms (so-called hybrid tokens) can also arise, which have individual characteristics from several token categories.

However, the FMA points out that there is currently no legally recognised classification of tokens either in Austria or at European or international level.[4] Therefore, the above classification does not provide any final conclusions on their assessment under supervisory law. It simply facilitates the overview of the types of tokens found on the market.

b. Security Token

Security tokens represent **claims to payments of a certain amount of money** ("future cash flow") against the issuer. The characteristics are therefore similar to those of traditional securities, especially bonds or shares.[5] In principle, it is not mandatory that these claims exist in legal currency. In addition to **pecuniary rights** (e.g. dividends, interest or repayment claims), **administrative rights** (e.g. participation and voting rights at a general meeting) may also be covered by security tokens.[6]

Security tokens are often considered as transferable securities within the definition of MiFID II[7] or WAG 2018[8], as they fulfil the criteria contained therein:

I. Representation of a **property right**
II. **Tradability** on the capital market
III. **Comparability** with types of securities tradable on the capital market
IV. **No exception** to the definition of a security

If a token is thus to be classified as a security, this results in a large number of requirements under financial market law, depending on the specific structure. These include, for example, the obligation to publish a prospectus[9], concession obligations and other legal regulations.[10]

c. Payment Token

A payment token is a token whose primary purpose is a **payment function**. Payment tokens represent a certain value that can be used to purchase goods or services from persons other than the issuer. Payment tokens are not intended for any other use.[11]

According to the FMA, the concrete circumstances of the individual case are always of essential importance for the regulatory treatment of payment tokens. Depending on the specific structure of the token, a number of different elements may be **subject to a concession**. The most important concessions are the **issuance and administration** as defined in § 1 para 1 no 6 Banking Act[12] and the **issuance of e-money** as defined in the E-Money Act 2010[13]. It depends on whether the token can be used for payment at third party acceptors and whether it can be purchased or exchanged for money. However, in the case of the **issuance of payment instruments** according to § 1 para 2 no 5 Payment Services Act, personalisation is the relevant factor.[14]

In the case of issuing regional currencies (in the form of tokens), the E-Money Act 2010 could be applicable. The FMA considers payment tokens as e-money on principle, since payment transactions are to be carried out with them and they are accepted by third parties in lieu of payment.[15] Due to the application of the E-Money Act, the issuing body (e.g. a municipality) would have to be licensed by the Financial Market Authority (FMA) as an e-money institution. However, the exemption of a **limited network** pursuant to § 2 para 3 no 1 E-Money Act could be relevant. In this case, the concession obligation would not apply.[16] Small and specific systems should not fall under the strict supervisory laws. However, as soon as the system allows for broad applicability, regulatory provisions may be relevant. In principle, open networks therefore do not fall under the exemption rule, as they are usually intended for a constantly growing network of service providers. Broadly accepted tokens will thus in any case not fall under a limited network.[17]

According to the FMA, whether a limited network exists is to be determined by the following criteria:

- geographical range of the system
- the number of acceptors
- the diversity of products and services
- validity limits and any amount limits may also play a role.

In general, the FMA uses the different questions as criteria for the supervisory assessment of whether a concession obligation may exist. [18]

d. Utility Token

Utility tokens are primarily used to provide the holder with a benefit in relation to a specific product or service.[19] Often they grant access to a digital platform of the issuer, which can be used by the holder of the utility token in a certain way. However, utility tokens appear in many different forms and often also fulfil the function of payment tokens or security tokens (so-called hybrid token), with the result that the definition is complex and the regulatory

categorisation is difficult. Utility tokens can be linked to the right to participate in the development of a product or service, to use a product or service or to redeem the token for a product or service. [20] Utility tokens are often combined with an immanent payment function towards the issuer or other users of the issuer's platform.[21]

If the token can only be used for the development of a product or service and is not otherwise linked to other claims, or if the token only grants access to a product or service without also serving as payment, there is usually no connecting factor under supervisory law according to the **current legal situation[22]**. Depending on the design of the business model, a concession obligation may nevertheless exist in individual cases. If the token can be redeemed with the issuer or with other users of the platform for the use of a product or service, it fulfils a payment function and is therefore comparable to a payment token. In this case, the same criteria and exceptions are relevant for the regulatory classification as for payment tokens (see above).

Due to the large number of different ways of structuring utility tokens, it is always necessary to analyse on a case-by-case basis whether regulations under financial market law could be applicable. Furthermore, European regulations are also planned for utility tokens in the future.

e. Outlook at European level

In September 2020, the EU Commission (COM) published the so-called Digital Finance Package.[23] Part of the Digital Finance Package was the drafting of a new supervisory regime for so-called crypto assets, the **Markets in Crypto-Assets Regulation** (MiCA).

The MiCA regime is generally intended to create a consistent regulatory framework for issuers and service providers of crypto assets. A crypto asset is "*a digital representation of value or rights that can be electronically transferred and stored using distributed ledger technology or similar technology*".[24] In general, the MiCA-V provides for a threefold classification of crypto assets: I) Asset referenced tokens (ART), II) E-money tokens (EMT) and III) all other crypto tokens that are not tokens mentioned above (especially utility tokens).[25] Thus, MiCA creates a catch-all approach and **framework for all types of crypto assets** that are intended to be traded.[26] However, MiCA does not apply to security tokens, as these already fall under a different and stricter supervisory regime (including MiFID II, Prospectus Regulation).[27]

The MiCA is planned as a **regulation** that is directly applicable in the member states. Therefore, implementation by the member states is not necessary. However, individual national regulations (e.g. on the responsibility for the supervision of issuers and crypto service providers) must be enacted.

Currently, the MiCA is still at the **draft stage**. As of 6 June 2022, several drafts exist which reflect the different positions of the COM[28], the European Parliament[29] and the Council of the EU[30] and provide the basis for the trilogue negotiations. All currently planned provisions can therefore still change fundamentally. In this respect, there is currently no

officially date on which the MiCA will enter into force. If the trilogue negotiations progress quickly, the entry into force can be expected in 2023.

f. Preliminary recommendation when introducing new business models

According to the FMA, tokens can only be qualified under supervisory law in individual cases. Before implementing a planned business model, it is therefore **recommended to contact the FinTech contact point[31] to clarify any supervisory laws that may have to be complied with**.

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[1] *Marek*, Emission digitaler Assets, in Piska/Völkel, Blockchain rules (2019) Ref 9.7.

[2] Cf *Marek* in Piska/Völkel Ref 9.8 et seq.

[3] FMA FinTech-Navigator, „*ICO: Aufsichtsrechtliche Einordnung von Coins und Tokens*“, <https://www.fma.gv.at/kontaktstelle-fintech-sandbox/fintechnavigator/initial-coin-offering/> (last requested on March 9, 2022)

[4] See, however, the European regulatory proposals, in particular the MiCA Regulation, which classifies tokens.

[5] See *Steiner*, Krypto-Assets und das Aufsichtsrecht (2019) 21 et seq.

[6] FMA FinTech-Navigator.

[7] Directive on Markets in Financial Instruments 2014/65/EU; see Art 4 para 1 no 44 MiFID II.

[8] Securities Supervision Act 2018 (*Wertpapieraufsichtsgesetz 2018 – WAG 2018*), Federal Law Gazette I 2017/107 as amended by Federal Law Gazette I 2022/36; see § 1 no 5 WAG 2018.

[9] See Prospectus Regulation 2017/1129/EU.

[10] FMA FinTech-Navigator.

[11] See among others *Zickgraf*, Initial Coin Offerings – Ein Fall für das Kapitalmarktrecht? AG 9/2018, 293 (296); *Hacker/Thomale*, Crypto-Securities Regulation: ICOs, Token Sales und Cryptocurrencies under EU Financial Law Hacker, 15 European Company and Financial Law Review 645-696 (2018), 12; *Klöhn/Parhofer/Resas*, Initial Coin Offerings (ICOs), ZBB 2/2017 93, FMA FinTech-Navigator, ESMA Advice on Crypto Assets ESMA50-157-1391, 23.
FMA FinTech-Navigator.

[12] *Bankwesengesetz – BWG*, Federal Law Gazette 1993/532 as amended by Federal Law Gazette I 2022/36.

[13] Federal Law Gazette I 2010/107 as amended by Federal Law Gazette I 2018/37.

[14] FMA FinTech-Navigator.

[15] FMA FinTech-Navigator, „*ICO: Diese Konzessionstatbestände müssen Sie als Akteur beachten*“.

[16] See FMA Letter 01/2020, „*Begrenzte Netze - Anzeigepflicht gem. § 3 Abs. 4 ZaDiG 2018*“, see <https://www.fma.gv.at/fma/fma-rundschreiben/> (last requested on March 30, 2022).

[17] FMA FinTech-Navigator.

[18] See FMA Letter 01/2020.

[19] Cf FMA FinTech-Navigator.

[20] See Blockchain Bundesverband, Statement on Token Regulation (2018), 3; FMA FinTech-Navigator.

[21] See EBA, Report with advice for the European Commission on crypto-assets, 9.1.2019, 7; ESMA Advice, 23.

[22] Cf the European developments below III.e.

[23] *European Commission*, Press release of the Digital Finance Package from 24 September 2020, see <ec.Europa.eu/commission/presscorner/api/files/document/print/en/ip_20_1684/IP_20_1684_EN.pdf > (last requested on May 25, 2022).

[24] Art 3 para 1 no 2 MiCA.

[25] Rec 9 MiCA.

[26] See Rec 8 MiCA.

[27] See Art 2 para 2 MiCA.

[28] COM (2020) 593 final.

[29] A9-0052/2022.

[30] 14067/21 LIMITE.

[31] Online contact form for legal questions on FinTech models available at <https://www.fma.gv.at/kontaktstelle-fintech-sandbox/fintechnavigator/kontaktstelle-fintech/> (last requested on June 8, 2022)

Appendix B: Field Research Results

Documentation of research and participation process

The original plan was to integrate the citizens into the project in November 2021. Due to the Corona pandemic, a fourth lockdown was declared in Austria in the winter months of 2021/22, which meant that the "go public" had to be postponed.

Finally, the first information event on the REC for the citizens of Stanz took place on February 21st 2022. The citizens of Stanz were informed about the event by means of a direct mailing to all households. A total of over 70 people attended the event, which was a great success and reflects the broad interest in this topic in Stanz. The agenda of the information event was as follows:

- What is an energy community?
- What are the advantages of an energy community for each individual?
- What are the advantages for the community, community development and the location of Stanz im Mürztal?
- Presentation of the association and its purposes
- Outlook and further procedures
    - Creation of legal conditions with the local network operator
    - Installation of a community PV system in the sense of a citizen participation process
    - Exploration of an own tariff with the local network operator
    - Advising the members of the association on the realization of private PV systems.

In a subsequent open question and answer session, the visitors of the event had the opportunity to clarify their uncertainties regarding the project and to ask further questions. The many questions about the establishment of the energy community, the installation of the community PV system and the general requirements for membership in the association underlined the great interest in the topic. During the information event, for the first time, people had the opportunity to become members of the association "EG Stanzertal". The association gained 15 members on that day and 20 more in the following days. In the meantime, about 60 people are members of the association that will run the REC.

During the information event, the plan to combine decentralized energy production, energy exchange and the establishment of a local currency was presented to the people of Stanz

for the first time. The communication was done in a sensitive way, because at that time there was no knowledge about how this idea would be received by the citizens and individual stakeholders. Furthermore, it was crucial to only communicate projects that had a real chance of being implemented. Over the last few years, the people of Stanz have built up trust in sustainable municipal development in line with a smart village approach. In this respect, it is important to handle this trust respoenternsibly.

With this initial information, there was now the possibility to intensively enter the research project, to investigate acceptance, areas of application, uses, technical necessities by means of social science methods and to start a participation process.

Consequently, the 35 members of the association registered so far were invited by e-mail and telephone to a working group meeting on February 2nd, 2022 between 4pm and 6pm according to the method of the focus group discussion format. Rainer Rosegger and the chairman of the association "EG Stanzertal" chaired the meeting with a total of 13 people present in the meeting room of the municipal office in Stanz im Mürztal. The overall objective of the first working group meeting was to gather more in-depth information about the Energy Community's project and to discuss the individual concerns of the members on the basis of a discussion guide adapted to the focus group. After these general topics were discussed, the basis was given to debate the acceptance of the introduction of a local currency in the sense of the Energy Community.

Also on February 17th, people from the “quality of life group” were invited to a meeting in the community hall. They were chosen because of their good knowledge of the population of Stanz and their voluntary activities for the municipality. At this workgroup meeting, the focus was particularly on volunteering in Stanz and the introduction of a digital local currency as an extension to the analogue voucher system. Especially the questions of the remuneration of the voluntary work were discussed.

On February 18th, the third working group meeting took place. The 45 members of the energy community were invited. An attempt was made to explicitly reach the prosumers from the energy community. On this day, 13 members of the association as well as Mayor Fritz Pichler were present and Rainer Rosegger moderated the working group meeting.

On March 16th, the first four semi-structured interviews with entrepreneurs from Stanz took place. The focus was on the acceptance of a digital local currency as an extension to the analogue, already established Stanz voucher. On April 25th, an interview was conducted with a potential investor for a large-scale photovoltaic plant in Stanz. The subject was his assessment of the introduction of a local currency based on the REC.

On April 6th, 2022, the last two working group meetings on digital local currency took place. One with the “quality of life group” on the topic of volunteering and one with selected members of the REC Stanzertal: the chairman of the REC, an electrical engineer who installs PV systems for private individuals and communities, the operator of the biomass heating power plant and an innovative farmer who is interested in installing a PV community plant on the roofs of agricultural buildings. In both meetings, the aim was to re-examine and validate the previous findings and to integrate any other relevant dimensions or topics that had not yet been taken into account.

Overall, it became apparent that, in accordance with grounded theory, a certain degree of saturation had been reached and thus solid empirical results on the research question had been achieved . Basically, the interest and acceptance for the introduction are very high. At each additional meeting there was a deepening of the topic and increasing enthusiasm arose among the participants.

To conclude the participation process, a conference on Stanz Tokens and the REC Stanzertal was held on May 6th and 7th. On Friday, May 6th, the focus was on the exchange of the experts and the transfer of knowledge between the individual projects. A representative from the Stanz+ project, a representative from the Styrian Energy Agency and the entire team from the Stanz Token project took part. This exchange was essential to integrate built-up knowledge from the other projects, to discuss technical and regulatory aspects and to create synergies between the projects.

On Saturday, May 7th, the conference took place in Stanz for stakeholders and interested people from the population. All municipal councilors, commercial enterprises with customer frequency, gastronomy businesses, owners of large plants and operators of the wind energy parks, all members of the REC and other relevant persons were invited.

A total of 24 people and stakeholders participated, as well as the entire project working group. During this conference, in-depth aspects of the topic were presented and final relevant points were collected according to the research and participation project.

Working group meetings in focus group format

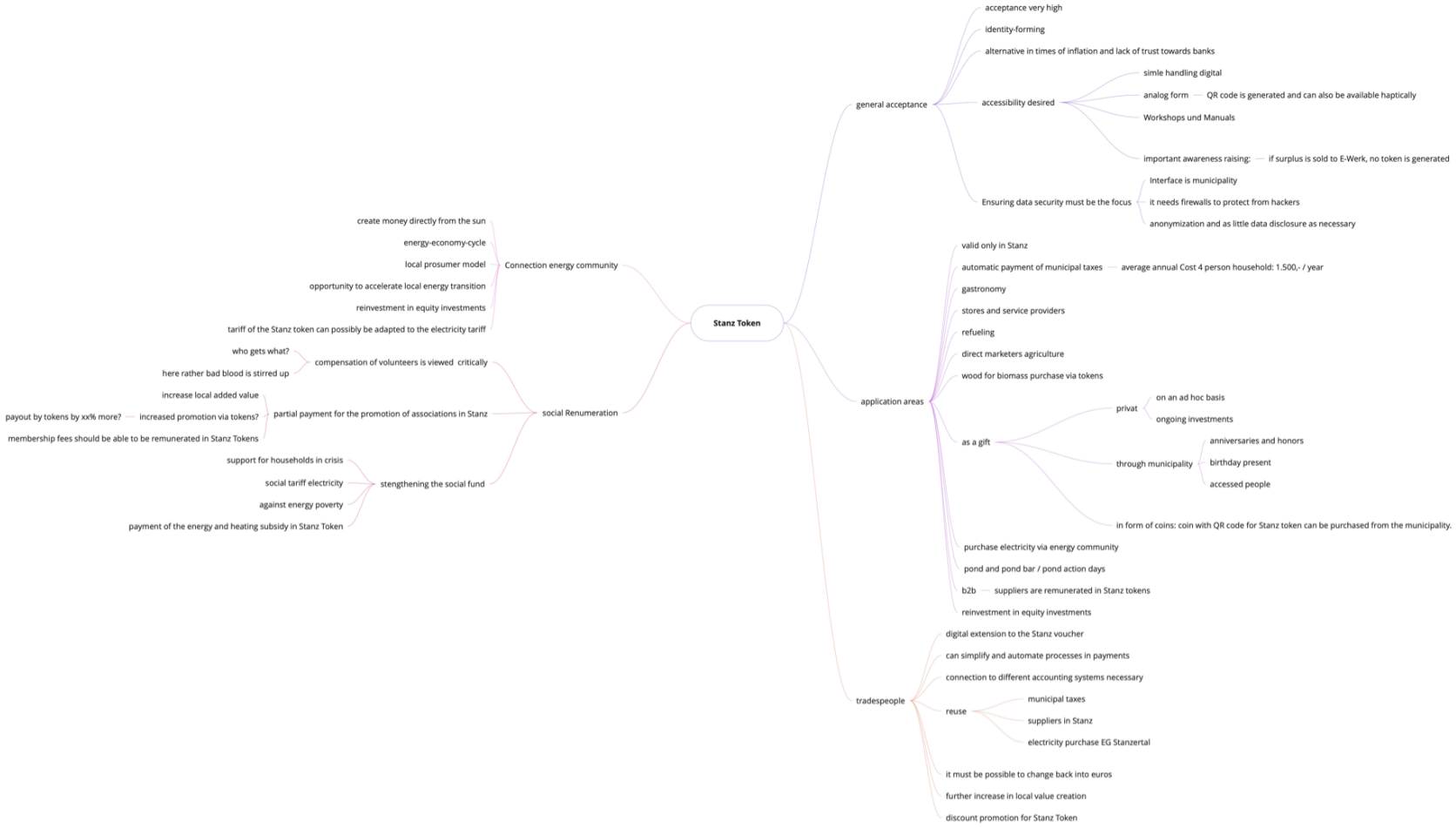
A contact pool of interested persons was gradually built up. Methodologically, it was decided to conduct the working group meetings as social science focus groups. Furthermore, due to the solid contacts of SCAN in Stanz, it was possible to integrate different groups and persons. The topics to be discussed were identified in advance and then a discussion guideline was formulated for each working group meeting. Based on the

discussion guide, the discussions could be shaped by the moderator. The discussions created a momentum of their own among the participants, whereby further relevant aspects - which might not have been taken into account in the previous discussion - could be integrated. All focus groups lasted about two hours and were recorded on site. Afterwards, the focus group discussions turned into a social gathering with drinks and snacks. This social part is important to give back appreciation to the participants and to strengthen networks.

Semi-structured interviews

For the interviews, as with the focus groups, guiding questions were drawn up in order to find out about the general acceptance among the companies. Consequently, questions were defined for the individual topics and adapted to the respective areas of activity of the companies.

Results from research and participation process according to grounded theory



Open Space Conference

Conference on 06.05.2022

As already mentioned, the knowledge transfer with experts on the topic of energy community took place on May 6th from 10 am. The Institute for Sustainable Technologies (Stanz+, FFG), ABC, SCAN, Caliberco and the Energy Agency Styria were present. This online conference was moderated by Rainer Rosegger. Furthermore, it was held and recorded via the platform Zoom.

After a round of introductions and the presentation of the three guiding themes, which were based on projects from the recent past for the Stanz region, the presentations started immediately.

First, Martina Majcen from AAE Intec (Institute for Sustainable Technologies) moderated the knowledge transfer from the Stanz+ and the FFG project in Stanz, which has been running since 2019. The overall goal in this project is to create the municipality of Stanz im Mürztal with its weak infrastructure into a best practice municipality for Austria in terms of an innovative PlusEnergyQuarter. From the original project "City of the Future" the goals were formulated, which are now to be implemented in the FFG Stanz+ project. The focus is on optimizing and expanding energy networks, increasing the use of renewable energy sources, and revitalizing the town center in Stanz im Mürztal. Among other things, the expansion of PV plants, the expansion of wind power plants as well as the creation of a Rural Pioneers community and cooperative business models will be promoted. The foundation of the Energy Community Stanzertal plays an essential role.

With inventory analyses of the energy networks, building surveys and inspections of the Upper Stanz, an energy balance sheet was created and potentials for the region were identified. In addition, surveys were conducted with building owners on the condition of the houses and, in particular, to raise awareness among the population. With the renovation of the community center and the establishment of a local supplier, essential points in the project could already be ticked off.

Furthermore, the losses in the heating network were determined and initial efforts to create a buffer for district heating were conceptualized. An application for the reconstruction of the hydroelectric power plant has been submitted. The expansion of wind power is under negotiation as of May 2022.

With the integration of hydropower and wind power and the construction of PV plants and potential storage facilities for electricity surpluses, the municipality of Stanz im Mürztal can thus become a multiplier for energy communities in Austria.

The creation of new business models for energy production and energy distribution in structurally weak communities will also be decisive for this.

After the exciting presentation about the technical background of the project in terms of the energy community, Caliberco with Mirella Bärnthaler and Lisa Schatz (agency SCAN) presented the project status in 2Villages 21.

Based on the renewable energy community "Stanzertal", a local currency can be created in close connection with energy production. The rural community can create new opportunities for the energy community and thus new value flows based on energy for the region. After a short presentation of the project and the goal, the status quo (May 2022) within the Stanz Tokens project was presented. Further on, international best practice examples were discussed, the results of the participation process were explained and the functionality of the E-Token was explained.
After a round of questions, especially related to the Stanz Token and its incentivization, Johannes Kohlmaier from Energie Agentur Steiermark presented the platform "Energiegemeinschaft". The platform "Energy Community" serves as an interface for energy communities from all over Austria, which supports and accompanies the foundation of energy communities and provides interested persons with information. By creating a solid base of experience, people who want to establish an energy community in Austria can find step-by-step instructions on the platform. There is also the possibility to take advantage of training offers. Within the platform, the Stanzertal energy community also acts as a pilot community. Here, too, the status quo and the current challenges were presented in terms of the Energy Community Stanzertal and the energy communities throughout Austria.

Conference on 07.05.2022
As mentioned in the methodology, the conference took place on Saturday, May 7 in the on-site community hall.
The participants consisted of experts from the Vienna University of Economics and Business, ABC, Caliberco, SCAN and stakeholders from Stanz and participants from the energy community.

The conference started at 10 a.m. under the moderation of Rainer Rosegger with the presentation of the project to become a pilot community for Austria and the EU. After that, the mayor welcomed the 24 participants of the conference. He then presented the superstructure of the project and the central questions of today's conference, which were as follows:

- How can we, as a structurally weak municipality, counteract current events?

- How can we counteract distortions?
- How can we target which resources?
- How can we become autonomous as a small community?

After the introductory words of the mayor Fritz Pichlers, the chairman of the energy community Sven Aberle put all participants concerning the events on the newest conditions (May 2022):

- With the local electricity company there is at present a good agreement in the sense of the energy community.
- Feedback from outside: In the meantime, everyone knows the Stanz with its project. This is observed with a lot of positive encouragement
- We are taking a pioneering role and have a lot of support from outside.

Bernd Vötsch, who was present on behalf of the province of Styria and the "LA21" process, then welcomed the participants. The LA21 process was instrumental in creating the framework for the current Smart Rural project.

The meeting continued with the presentation of the current project status and the introduction of Caliberco and ABC, which was followed by the presentation of Professor Alfred Taudes from the Vienna University of Economics and Business (and co-founder of ABC Research) about Blockchain technologies in connection with energy communities.
Professor Alfred Taudes presented the benefits and purposes of a renewable energy community and showed the potential advantages based on pilot projects in Austria, such as Schnifis, Vorarlberg or urban pioneers, Vienna. He then presented models of decentralized electricity billing and infrastructure solutions in terms of the energy community. Some of the benefits may be that there can be a community-based billing system, immutability and thus anti-counterfeiting, and flexibility in areas of use. For example, prosumers can generate their tokens by generating surplus power into their wallets tokens and use and exchange them in the locality in many ways. The benefits of local currencies in terms of promoting and stabilizing the local economy were also presented.

Following the presentation, there was an open Q&A session with the previous presenters, which can be divided into two topics as follows:

- Energy and Volunteerism

Volunteerism and energy are central roles in the project. There should be the possibility to remunerate unrewarded care work in order to ensure stability and willingness to volunteer in the community. Thus, "fame and honor" can be recognized by receiving tokens.

- Accounting systems and local currency

Within the accounting systems one must pay close attention to the reactions of the population. Learning by doing applies. Therefore, there is also a high demand for flexibility. Currently, only a quarter of the value creation remains in Stanz. In order to maintain the infrastructure, it is important that more people shop in the village. In addition, it is necessary to talk to business operators whether they accept the token as a means of payment.

The local currency is not a blockchain but a decentralized money system and thus functions anonymously.

Whether or not the currency should expire is up to the community to decide and is a question of system design

After the Q&A session, there was a historical presentation on the pioneering days of electricity generation in Stanz by historian Anna-Maria Kohlhofer, who based on the founding of the Stanzertal Energy Community, took up and presented the history of electrification.

After a 45-minute break, the event continued with two discussion tables on the topics of the energy community and local currencies in a world cafe format. These were moderated by Professor Alfred Taudes and Vinzenz Treytl (both ABC) and lasted 1.5 hours.

This was followed by the presentation of results by the members of the conference and the moderators respectively. The results are summarized on page 45 of the report.

List of Stakeholders

stakeholder group	brief description	defintition	relevant topics	relevance
Energy producers / suppliers	Network supplier / energy supplier for the region / utilization of potentials within the renewable energy communtiy / cooperations / grid supplier / boundary of participation / distribution of smart meter	1. E-Werk Kindberg 2. Windpark 1+2 Hainzl und 3 (75 MWP) 3. Hydroelectric power plant (planned 80KWP) 4. Small hydropower plant 5. Biomass heating plant (350KW + 1 MW) 6. PV systems	1. Provide energy 2. Grid operators (E-Werk Kindberg and Biomass heating plant) 3. Purchase of electricity from the REC and possible storage solutions (power2heat) (biomass heating plant)	high
Municipality Stanz im Mürztal	initiatior local currency an local energy production in the sense of the association; in the sense of the association; in the future only plays the role of an association member	1. Territorial authority and administrative unit 2. Enabler and facilitator of the "Stanzer Way" 3. Initiator of the local energy transition 4. Public services for population 5. Member of the renewable energy community (Prosumer)	1. Stanz-Token - central administration of Stanz Tokens - acceptance of Stanz Tokens in form of payment for municipal charges - purchase of Stanz Tokens in form of vouchers - financial support: Stanz Token in the form of grants - payments of (association) grants - municipality as exchange office 2. burden shifting 3. EG Stanzertal 4. black-out prevention 5. energy storage possibilities	high
Association of the REC "EG Stanzertal"	Association-supporting organization of the renewable energy community according to EAG / acquisition / consulting / feasibility / statics	1. Governing body of the REC 2. Interim between energy supply companies and assoc. members 3. Consultative activities in the area of technical infrastructures 4. Communication with regulatory authorities and relevant networks 5. Members divided into - producers - prosumers - consumers	1. Stanz-Token - generation of Stanz Token by surplus current - circulating the Stanz Token - payment of the membership fee in Stanz Token 2. PV citizen participation systems - management and organization of the plants - aquisition and consultingff 3. PV plants - acquisition - consulting - feasibility - statics 4. Energy storage possibilities	high
Private households Stanz im Mürztal	Electricity consumers of electricity from the REC / private investors / purchasers of the Stanz Token in the sense of gifts and advancement of the regional economy	1. Stanz has around 800 private housholds 2. Around 50 private households are now members of the REC	1. Consumers 2. Producers 3. Prosumers 4. Customers for local businesses 5. Private investors	high
Farmers	Electricy producers / electricy consumers / provision of land for potential participation projects in the sense of the REC / water mills / direct marketing / farm vacations / Emma hikers / regional suppliers	1. According to the 2010 survey, there are 244 agricultural holdings in Stanz 2. Of these, 56 were farms with at least one full-time job 3. It can be assumed, that the number of farms has decreased since 2010	1. Purchase of electricity 2. Producers of electricity 3. Roofs and grasslands for possible large PV installations 4. Producers of regional goods 5. Partial Agri Tourism provider	high
Entrepreneurs	acceptane of the Stanz Token as a regional currency / energy-efficient economy / burden shifting	1. Trixis Dorfladen operates the local supply with a focus on regional and o 2. There are six gastronomy facilities in Stanz 3. There are 25 other businesses in Stanz	1. Purchase of electricity 2. Partial space for PV systems 3. Part of the local economy and thus of the bossible local currency sy	high
critical infrastructures	autonomous supply of energy indipendent of the general power grid	1. Medical care in the village 2. Municipal office 3. Food supply / Trixis Dorfladen 4. Fire department	1. Are dependent on supply in the event of power failures (black out)	high
other associations	association payouts in Stanz Tokens to promote local value creation	1. There are around 30 associations in Stanz	1. Consume energy 2. Are important for social life in Stanz 3. Could be a leverage for the local currency via association funding	high
non digitals	would like to use local currency / Stanz Tokens - but can't / won't use app control or smartphone for this / desire haptic for Stanz Tokens (age: up to 13 and 60+)	1. Older population (persons 60 and over) 2. Younger population (children up to 13)	1. Are dependent on an analogue variant of the local currency 2. Workshops can be organised for these groups of people	high
Children / Youths	making the energy transition visible through workshops / playful development of the general understanding of regional value creation / children as role models in the sense of environmental awareness / users of the Stanz Tokens	1. In 2021, around 200 Stanzer were between 5 and 19 years old 2. Around 60 children were of primary school age	1. Stanz Token - acquiring goods and services - receiving gifts in the form of tokens (e.g. education fund) 2. Playful learning of the regional energy transition	medium
Volunteers	within Stanz there are 80-100 volunteers who vontribute to the community in various ways / see Hupf-Auf-Bankl, Kost-Nix-Laden, E-Taxi...	1. In Stanz, there are about 80 people who are voluntarily involved in cpmm	1. Possible renumeration / support though Stanz Token	medium
funding agencies / operational organizations	making public (financial) resources available / exchange of experience / know-how / networking activities	1. Grants and funding institutions at regional, netional and European level 2. Universities and research institutions 3. Relevant research projects 4. Austrian Coodination Office for Energy Communities	1. Financing of further R&C projects 2. Knowledge transfer 3. Diessemination of knowledge	high
Control authorities		1. Financial market control 2. National bank 3. Tax Authority 4. Municipal Supervision Province of Styria	1. Control compliance with legal requirements	high

Appendix C: Stakeholders within the Token Economic System

Explaining Figure 6 - Stakeholders – Roles within token economic system (extended)

Name	Producer	Producer (Descr.)	Producer (Relevance)	Consumer	Consumer (Descr.)	Consumer (relevance)	Prosumer	Management	Operator of critical infrastructure	Users of token	User of token (Relevance)
EG Stanzertal	potentially yes	# strategic decision of business model, whether or not REC owns generation facilities (e.g. as a reserve asset, as a conduit for crowd-financed facilities etc.)	low-mid	no	# association as such is assumed to have no energy consumption	zero-low	No	yes # manages facilities owned by REC # manages infrastructure of token economic system # supports members # communication with general public # finances projects	yes # infrastructure management systems # user-sided applications (e.g. Dashboard etc.)	potentially no # as an operator of facilities, REC creates tokens # in other cases REC might have role of conduit via infrastructure # direct use is expected to be limited	low
Gemeinde Stanz	potentially yes	# owner of primary school PV installation	mid	yes	# energy demand of infrastructure of municipal buildings and services (School, Kindergarten, etc.)	high	Potentially yes	yes # manages Stanz Gutschein	no	yes # creates tokens via energy generation # creates token via DLC	high

										# receives tokens for municipal taxes	
E-Werk Kindberg	no	Within the REC, E-Werk Kindberg is not considered a producer;	zero	no	Within the REC, E-Werk Kindberg is not considered a consumer;	zero	no	no	no	no	none
Commercial Energy Producers	yes	# operate mid to large scale renewable energy generation facilities # business operations focused on energy	high	yes but low	Consumption for operation of facilities, net producer	low	yes (but only to a very small degree)	potentially yes	yes	yes # as net producers, potentially large generator of tokens # biomass plants could be users of DLC for procurement of raw materials	high
Household (Prosumer)	yes	small private PV installations on premisses	low-mid	yes	low consumption; energy for personal use (household, electric vehicle, etc.)	low	yes	no	no	yes, as generators of energy and as users of DLC	low-mid

Household (Consumer)	no	n/a	zero	yes	low consumption; energy for personal use (household, electric vehicle, etc.)	low	no	no	no	yes # as consumers of energy and as users of DLC # as a potential investor in co-owned generation facilities	low-mid
Associations, initiatives and voluntary work	potentially yes	# installations on association-operated premises	low	yes	# consumption ranging from low to mid	low-mid	Potentially yes	no	no	yes # as recipients of subsidies paid out in DLC # as acceptance partner for DLC (e.g. association member fees, donations) # as generator (if prosumer)	high

Individuals	no	n/a	zero	no	n/a	zero	no	no	no	Yes # as users of DLC # as potential investors in co-owned generation facilities	low-mid
Local businesses (general)	yes	# PV-panel installed on business premises	low	yes	# depending on the type of business, energy consumption for running the business can be high # examples for large consumption: Trixi's due to cooling requirements, gas station if EV-loading station is provided	high	Potentially yes	no	potentially yes # Depending on type of business and type of machinery operated # E.G. cooling aggregates can be used for peak shaving # e.g. EV-charging station can be used in storage concept	yes # acceptance partner of DLC # user of DLC	potentially high
Local businesses (farmers)	yes	# PV # hydro-power	low-high (depending on generation assets)	yes	# depending on the type of business, expected to be comparably low	low-mid # depends on type of business	yes	no	no	yes # acceptance partner of DLC	potentially high

										# user of DLC	
Contractors (various)	no	n/a	zero	no	n/a	zero	no	no	no	no	none
Regulators and supervisory bodies	no	n/a	zero	no	# setting of regulatory frameworks # enforcement of regulatory frameworks # consulting (to a limited extent)	zero	no	no # but influence permissible processes and designs	no	no	none
Funding Agencies	no	n/a	zero		# funding / grants for the implementation of projects # networking hub # expertise & know how # Influence environment (regulators, frameworks, standards etc.)	zero	no	no	no	no	none

Consultants & other service providers	no	n/a	zero	no	# operative support in project planing and implementation # operative support in ongoing operational management	zero	no	no	no	no	none