Energy Community in

Stanz im Mürztal

BEST PRACTICES OF RENEWABLE ENERGY COMMUNITIES

July 2021

This report on Best Practices of Renewable Energy Communities presents examples and processes related to the development of decentralised micro-grids and energy communities, also considering the application of blockchain-based technologies. Key features of the presented cases and the relevance to the energy community of Stanz are highlighted.

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Best Practices of Renewable Energy Communities

Energy Community: ACOPREV

Country: France

Powered by: Solar Energy, Hydrogen

Website: http://www.acoprev.centralesvillageoises.fr/

ACOPREV is attempting to push the self-consumption and local energy autonomy concepts as far as they will go. They are involved in EU-funded experiments in collective self-consumption of solar energy, and also intend to develop a hydrogen-powered car sharing program. The medium-term goal is to create a rural microgrid that is energy-independent, integrating as many forms of energy usage as possible. The organization is not a formal cooperative, but its voting system is at least somewhat democratic since it is a part of the Centrales Villageoises network.

The initiative began in 2016 thanks to the impetus of three mayors and former mayors of Saint Julien en Quint, driven by the conviction that the development of new renewable energies in rural territories must be accompanied by the creation of future professions and skilled jobs that cannot be relocated. These jobs will complement agricultural activities to ensure the future of young people in rural regions. Public meetings on this project made it possible to obtain the consent of the inhabitants and their encouragement to implement a collective energy transition strategy on the scale of the Val de Quint.

ACOPREV is a member community of **L'Association des Centrales Villageoises** (Association of Village Centres) of Val du Quint, an umbrella network of renewable energy social enterprises promoting:

- Installation and operation of renewable energy production plants and the sale of the energy produced.
- The development and promotion of renewable energy and energy savings in each region.
- All civil, commercial, industrial, movable, real estate and credit operations directly or indirectly useful for the development of the renewables sector.
- Real estate investments in the territory comprising the Drôme municipalities of St Julien en Quint, Saint Andéol en Quint, Vachères en Quint, Sainte Croix and the neighboring municipalities of Marignac and Ponet Saint Auban.

L'Association des Centrales Villageoises is a network managed **by citizens and for citizens** and is active in several regions of France. The objectives of the national network is to build capacity in the community-led renewable energy sector by:

- promoting **integrated territorial approaches and bottom up governance** models

- developing **tools and shared services** (pooling actions) available to local companies, capitalising on experience and lessons learnt on the basis of solidarity between the Village Centers
- strengthening the **professionalisation of projects**, by maintaining high achievement standards and aiming at creating local jobs
- facilitating **innovative experiments** for the development of new legal and financial models, the diversification of renewable energy and energy management projects

Relevance to Stanz:

- Operation of a local micro-grid using different renewable energy sources
- Combination of local energy production-consumption with EU-funded Research & Innovation projects
- Member of umbrella network aiming to build capacity and scale for renewable energy at the regional level (several municipalities)

Energy Community: Mayenne Bois Énergie

Country: France

Powered by: Biomass

Website: https://www.mayenne-bois-energie.fr/

Created in 2008 at the initiative of the Pays de Haute Mayenne and civil society, Mayenne Bois Énergie is a Cooperative Society of Collective Interest (SCIC) which brings together suppliers, customers, employees, local authorities and technical partners of the wood energy sector.

The cooperative extended its operations in the entire region in 2012, to meet the increased demand. Mayenne Bois Énergie has grown from 32 members when it was created in 2008, to 181 members in 10 years (2019 figures). Once a year, a general assembly votes on approving the budget of the previous year, the renewal of one third of the members of the Board of Directors and the main orientations. Being a SCIC, each member has the right to one vote, regardless of the capital one holds in the structure.

Supply chain of biomass

Every autumn, Mayenne Bois Énergie technicians visit each farmer wishing to provide wood during the winter. These visits are an opportunity to estimate the volumes that will be supplied, depending on the hedges that each farmer wants to maintain. They also provide a chance of sharing experience and advice on maintenance and cutting methods ensuring sustainable hedge management. During these visits, the hedges cut in previous years are observed to ensure their recovery. Once the wood is felled, a second visit makes it

possible to re-estimate the volume to be chipped and to validate the quality of the cut and the diameters of the wood to be chipped. The wood chipping period is adjusted depending on the availability of space on the storage platforms, the weather conditions and the availability of the chipper. Generally, wood chipping takes place 1 to 5 months after its felling. Orders of biomass fuel are arranged according to a delivery schedule and prior agreement with each customer. Since 2017, the internalisation of transport allows the cooperative to be responsive and delivery of wood chips occurs within a maximum period of 5 days. In exceptional emergencies, the delivery time may be reduced to 48 hours.

Contracts with farmers are established for a minimum period of 3 years, allowing the management and marketing of biomass by following fair trade practices. This allows farmers to secure an income, while ensuring that the cooperative has an overview of future wood stocks. Specialised technicians provide advice to the suppliers, strengthening their organisational and technical skills. The payment for wood to farmers is remunerative of the gross product but also of the work provided by the operator. Sale prices to customers are decided and validated by the General Assembly, and are calculated as close as possible to the cost price. All member farmers sign a charter outlining sustainable management protocols of their bocage (pastureland divided into small hedged fields interspersed with groves of trees) and ensuring the maintenance of the hedges and the mesh on the farm.

Value-driven social cooperative

The statute of the cooperative outlines the key principles related to its Corporate Social Responsibility:

- Quantitative measuring of environmental impact
- Use of the cleanest energy technologies
- Guarantee good working conditions
- Promote diversity
- Develop green products and services
- Promote local employment
- Openness to dialogue
- Fight against corruption
- Be robust and long lasting

Relevance to Stanz:

- Integrative management of biomass fuel, connecting suppliers (farmers) with the cooperative and customers
- Inspiring value-driven operations of the social cooperative

Energy Community: Elektrizitätswerke Schönau

Country: Germany

Powered by: Solar, Gas, Cogeneration

Website: https://www.ews-schoenau.de

Elektrizitätswerke Schönau (EWS) was founded on September 18, 2009 in the town of Schönau in the Black Forest region of southern Germany. The cooperative was created at the time through the conversion of Netzkauf GbR, which had emerged from a citizens' initiative after the reactor disaster in Chernobyl. With its subsidiaries and associated companies, the energy cooperative is committed to the energy transition and a complete and efficient energy supply based on renewable energies. Civic engagement, co-determination and decentralization are among the cornerstones of its business activities. The number of members has risen steadily and sharply since the founding of the cooperative. Today there are already around 9,600 people who support and help shape the content and economic direction of the cooperative.

A citizens' electricity revolution

After the nuclear disaster at Chernobyl in 1986, a parents' initiative against nuclear power was launched in the small town of Schönau in the German Black Forest region. Since the local grid operator had constantly obstructed related citizens' activities aiming to save energy and to promote environmentally friendly power generation, local activists came up with the idea of acquiring the Schönau power grid to determine the conditions for its operation themselves. This anti-nuclear initiative stood firm and upheld its demand in two local referendums. As a result, this civil-society initiative was the first of its kind in Germany, in 1997, to take over the grid as well as electricity supply to the local community. The press endearingly referred to them as the "Schönau electricity rebels" who "had won a David versus Goliath battle", and the victory of the Schönau people over nuclear lobbyists was met with much enthusiasm throughout the country.

When the German electricity market was deregulated in 1998, EWS was quick to seize the opportunity to supply all its Schönau customers exclusively with electricity generated from renewable and cogeneration sources. As a result, Schönau completely freed itself of power supplied from nuclear and coal-fired plants. EWS also launched comprehensive programmes to subsidise the installation of renewable energy and cogeneration systems. This is why the proportion of electricity from green sources supplied to Schönau has increased ever since. The EWS-operated grid handles a very high percentage of solar electricity as well as power being fed in from a large number of small cogeneration units.

Nationwide green electricity sales

One year later, in 1999, the liberalised German electricity market was opened up to private households. This is when EWS began to supply customers with green electricity on a nationwide scale. The way EWS is doing business has always been based on stringent environmental criteria. Those not only exclude the supply of electricity from nuclear and coal-fired power plants, but they also subsidise renewable energy systems, promote reduction of electricity consumption and support the operation of climate-friendly cogeneration units, also known as combined heat and power (CHP). The installation and use of small cogeneration units are actively subsidized by the EWS, since they are considered an increasingly important building block in sustainable energy supply scenarios to promote energy efficiency.

Advancement of green electricity generation

Today, approximately 160,000 electricity users in about 800 grid areas across Germany have chosen Elektrizitätswerke Schönau as their supplier. This is not only due to the environmentally driven approach to local grid operation and the clean electricity mix, but also due to the promotion of new, environmentally friendly generation units. More than 70% of the electricity sold by EWS is supplied by regenerative power plants that must not be older than six years. Furthermore, producers of electricity also invest in installing new units or expanding existing systems. In addition, EWS is subsidising new, green power generation units among its customer base. To date, about 2,600 units were supported in this manner, ranging from rooftop photovoltaic systems and cogeneration units to biogas and small hydropower plants. Decentralised generation creates jobs and growth within a sustainable economy and forms the basis for a system of sustainable energy supply.

Political activities

The Schönau co-operative is not only working on implementing the German energy transition on a practical level but also pursuing a clear political agenda, including campaigns against nuclear energy, against granting massive subsidies to the construction of a new nuclear plant at Hinkley Point in the United Kingdom, and the campaign for the shutdown of the oldest French nuclear reactor at Fessenheim, to name but a few examples. At the same time, EWS is constantly contributing to the current political debate over amendments to existing energy legislation whilst also proposing its own drafts and boldly pursuing all available legal options up to the Federal Constitutional Court if and when required.

Dedication and motivational power

Elektrizitätswerke Schönau is more than just an electricity provider because its goals are much broader. EWS wants to encourage people to take matters into their own hands, to instigate change and to take action. Thus, its success is not only defined by the number of customers or subsidised renewable generation units.

What is immeasurable is the effect brought about by the dedication and motivational power that emanates from Schönau and instigates a large number of activities. The Schönau electricity seminars, for example, often attract people who share common goals and interests and join forces to plan and implement projects. This setting creates a constantly growing network of very active, environmentally driven initiatives.

Relevance to Stanz:

- Inspiring example of a pioneer community-driven energy project, which started in a small town in the mountains of southern Germany and managed to change the game of decentralised renewable energy supply nationwide
- Integration of social transition objectives into the marketing strategy
- Interesting subsidy scheme for cogeneration of renewable energy

Energy Community: BürgerEnergieGenossenschaft Wolfhagen

Country: Germany

Powered by: Wind

Website: http://www.beg-wolfhagen.de

In the town of Wolfhagen (14,000 inhabitants) in Northern Hesse, the municipal energy company set the city on the path of 100% renewables by supporting the creation of a citizen cooperative. In this pioneer remunicipalisation and community energy project, citizens participate in the ownership and governance of the local utility. Citizens own a 25% stake in the local utility, while the remaining 75% is fully owned by the city itself.

The town of Wolfhagen was one of the first German cities to remunicipalise its electricity grid. In 2003, the then "Stadtwerke" director convinced the local politicians to take advantage of E.ON's expiring 20-year concession contract and reclaim control over the distribution network. After three years of intense negotiations, a deal was finally reached in 2006. Shortly after, the city set the objective of becoming 100% powered by renewables by 2015. In 2013, to make sure citizens could benefit from the switch to renewables, the town supported the creation of a citizens' cooperative "BürgerEnergieGenossenschaft Wolfhagen". A quarter of the energy company 's shares was sold to the cooperative, and the city used the money for building the needed infrastructure.

The 100% renewable target was reached thanks to the construction of the city's wind farm. The cooperative now owns 25% of its capital and contributes to the strategic orientations taken by the utility, with two representatives of the cooperative sitting in the nine-member supervisory board of the "stadtwerke". Today, the cooperative's shares provide members with decent dividends. The energy company makes a profit every year. It was able to pay back its loans but also to build a kindergarten. The number of the company's employees has nearly doubled and it has won international prizes for its innovative projects on energy savings. Since 2005, some 284 municipalities have followed Wolfhagen's lead, including Hamburg, the second largest city in Germany, in reclaiming power over the energy sector.

The municipalisation process was very intense and time-consuming. This was in part due to E.ON's resistance, but also because such processes were uncommon at that time, therefore they needed to clarify a lot of technical, commercial and legal issues. The construction of the local wind farm encountered opposition by some part of the local community: the turbines were supposed to be on the mountain overlooking the town. The municipality launched a wide debate to ensure that all stakeholders' viewpoints and worries could be addressed.

Relevance to Stanz:

- Successful example of remunicipalisation of local energy, with strong ties between the local authorities and the community in the management and distribution of renewable energy
- Similar opportunity for reclaiming control over the distribution network after the expiration of concession contracts of wind energy farms in the region
- Example of reinvestment of profits as dividends to the cooperative members and as public infrastructure for the next generation (kindergarten)

Energy Community: Coopem

Country: Belgium

Powered by: Solar

Website: www.coopem.be

As part of its commitment to the EU Covenant of Mayors, the city of Mouscron (57,773 inhabitants) in Belgium, teamed up with its citizen to launch the "Coopem" (Cooperative Energy of Mouscron) - a joint venture between the city and its inhabitants that provides local households with attractive solar investment opportunities.

The city owns a 15% share in the cooperative, with the majority 55% stake belonging to the citizens of Mouscron and 30% to the companies Energiris and Aralia. On top of an expected yearly return on investment of up to 6% percent, the first members to join the cooperative were granted a favourable tax rebate on their investments.

The activities of the cooperative are focused on helping households install solar PV on their roofs. The Coopem removes the barrier of high upfront costs by advancing the payment of regional solar subsidies, normally granted over a five year period. It also handles the overall technical and administrative process from A to Z. This notably involves the joint purchase of equipment from local suppliers as well as the monitoring and validation of the installation process. End of 2017, the cooperative completed the joint purchase of 31 solar installations for Mouscron's households.

Local businesses are also a target group of the cooperative, which offers them a leasing plan for solar PV panels, financing 90% of the initial investments paid back over a ten year period through the selling of green certificates.

Thanks to the "one-stop-shop" approach provided by the cooperative, citizens were able to get easier financial and technical access to solar energy investments. This translated into CO2 emissions reductions figures contributing to the city's political commitment and also helped boost local jobs and economic activity in the city. Tabling on the success of the first edition, a second wave of installations is foreseen in 2018.

Other local authorities in Belgium are looking into the opportunity to replicate Mouscron's successful model. The existence of a regional subsidy scheme was among the favourable preconditions that helped the project get off the ground. To other local authorities interested in the approach, the Mouscron city officers suggest conducting a thorough mapping of available roof surface and test the ground heavily with citizens and companies to make sure there is actual demand for the project. In the city of Mouscron, two citizen meetings

were organised in the year preceding the launch of the cooperative. Citizens not only joined in but also proactively reached out to the city later on to find out about the progression of the initiative.

Relevance to Stanz:

- Interesting ownership structure of the cooperative between the city, citizens and energy companies
- Incentives for first investors (favourable tax rebate on investments)
- Investment support to households for installing photovoltaics on their roofs
- Leasing plan for installation of solar panels by local businesses
- Baseline study (mapping of surface available to photovoltaic installations and project demand) as well as participatory process in place

Energy Community: Green Energy Cooperative (ZEZ)

Country: Croatia

Powered by: Solar

Website: https://www.zez.coop/en/

Green Energy Cooperative (ZEZ) launched the first crowd-investing initiative in Croatia, supported by Križevci local authorities. Thanks to this initiative, a solar photovoltaic system is installed on the rooftop of Križevci Business Centre's administrative building.

Green Energy Cooperative provides solar equipment for lease to the Križevci Business Centre, the owner of the building, for 10 years. All investors signed a loan agreement with the Cooperative for 6 years, for which an annual interest on accrued funds is foreseen. This is the first crowd-lending project in Croatia, for the first citizen energy project. A total of 50,000 euros has been invested in this project. The modelled system (50 kW), installed on the rooftop of the business centre, will primarily cover the needs of the users of the centre in terms of electricity. KBC pays the actual electricity consumption, and from the monthly savings it would return investment to citizens-investors. The energy surplus will be sold to the network. After the 10 years (required for the investment to pay off) the system is transferred into the city's ownership and continues to make savings.

Krizevci is the first city in Croatia that has a solar power plant entirely financed by the citizens as small investors. The project is expected to save around 55 tonnes of CO_2 per year, thanks to the production of around 50,000 kWh per year. The new photovoltaic system will allow the business centre to save money on

energy bills while securing the return on investment for the citizens-investors. This initiative also allows the citizens to invest locally, for the development of their own city.

Citizen-investors were attracted by the convenient interest rate, higher than the one provided by commercial banks. Crowdfunding for renewable energy has become quite successful in the last few years. Many platforms are available to manage such projects and communicate with the participants. In addition, nowadays it is easier to obtain a good return on investment because of the decreasing costs of renewables. Members of the ZEZ are also co-founders of the Crowdfunding Academy, the most successful long-term crowdfunding project in Croatia through which dozens of teams have passed, and more than 20 successful campaigns have collected several million kunas. The cooperative offers professional and practical knowledge in the field of alternative financing to their clients, and is currently developing other alternative financing services, such as group investing (crowdinvesting) or micro-crediting (crowd lending) that will soon be available to citizens of the Republic of Croatia.

Relevance to Stanz:

- Interesting crowd-investment example for financing renewable energy infrastructure

Energy Community: Brooklyn MicroGrid

Country: USA (New York)

Powered by: Solar

Website: https://www.brooklyn.energy

Brooklyn Microgrid (BMG) is an energy marketplace for locally-generated, solar energy. The BMG marketplace allows prosumers (i.e. residential and commercial solar panel owners) to sell the excess solar energy they generate to New York City residents who prefer using renewable, versus fossil fuel, energy. Brooklyn Microgrid's mission is to assist in the proliferation of solar production and consumption throughout New York City.

Brooklyn Microgrid is an energy community project on a neighbourhood scale. The project is supported by the State of New York, through the New York State Energy Research and Development Authority (NYSERDA). This energy community currently consists of 150 homes. The announced objectives of the project are to encourage the development of microgrids to improve the resilience of the electricity grid in the face of natural disasters, to develop local renewable energy and to promote energy efficiency and intelligent demand

management. The project is being developed by the TransActive Grid joint venture composed of two young companies: LO3 Energy, a consulting company developing decentralized systems in energy and environment, and ConsenSys, a startup developing applications in blockchain technology.

The first step was to create a local energy market, which requires the ability to exchange and price energy directly and locally. To do this, it was necessary to increase the number of smart meters and to assign value to the locally produced energy through tokenization. If a producer/consumer produces more green energy than he consumes, then he has a surplus of energy. This surplus is sold back to the grid in exchange for tokens. These tokens can then be exchanged locally. They constitute a local energy currency, which functions similarly to other traditional, non-virtual local currencies.

Relevance to Stanz:

- Example can provide inspiration for the distribution and transactions of renewable energy using blockchain technology and cryptocurrencies

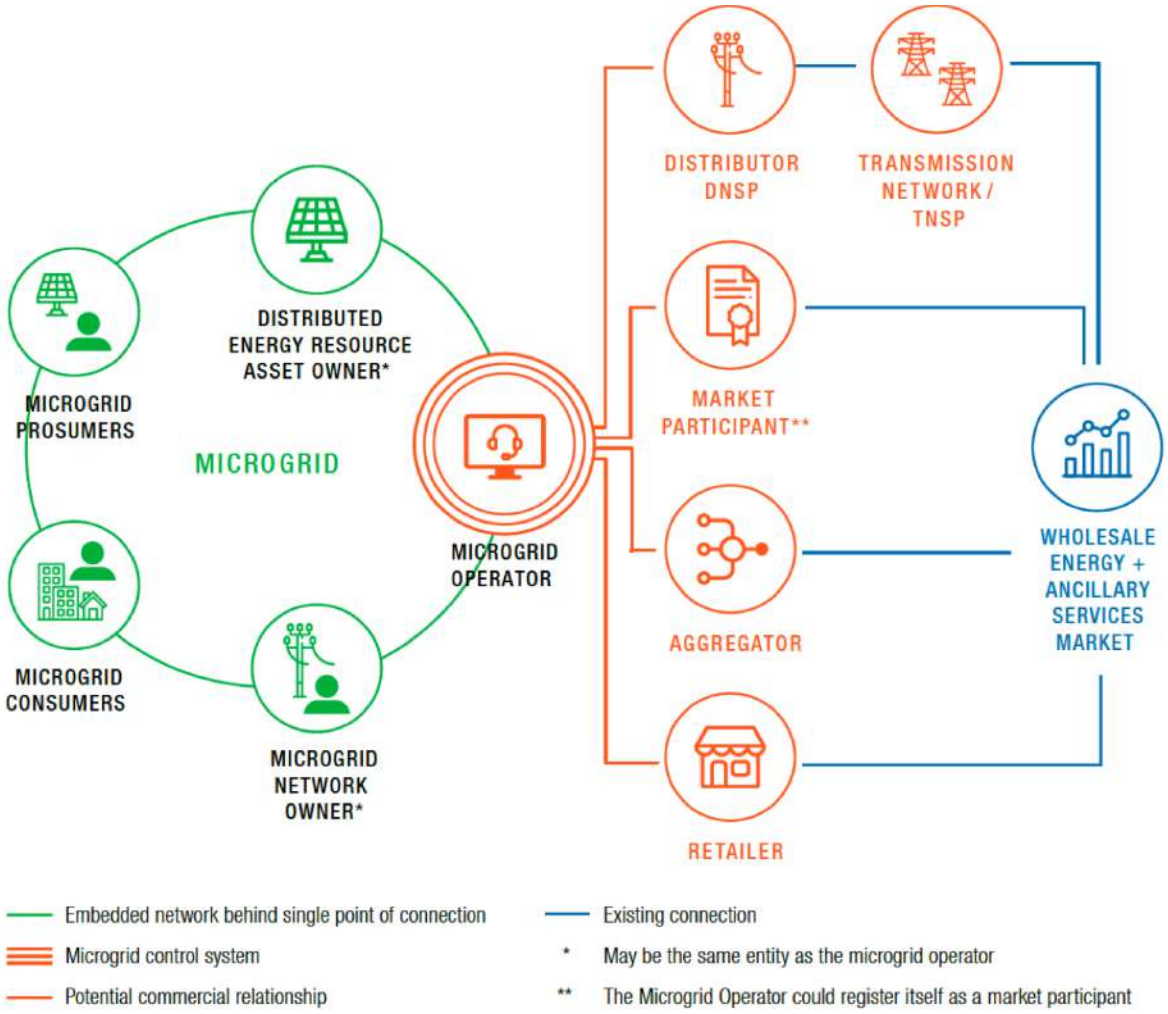


Fig. 1: Core elements of a micro-grid. Source: Khorasany M, Azuatalam D, Glasgow R, Liebman A, Razzaghi R. Transactive Energy Market for Energy Management in Microgrids: The Monash Microgrid Case Study. *Energies*. 2020; 13(8):2010. https://doi.org/10.3390/en13082010


EVNEX
NETWORK
CHARGE
FAULT

Best Practices of processes accelerating Transitions to Renewables

Soft Loan Scheme at Aradippou Municipality

Country: Cyprus

Powered by: Solar

A Soft Loan Scheme with favourable terms for the installation of photovoltaic systems on homes has been co-developed by Aradippou Municipality and the Cyprus Cooperative Bank. The Soft Loan Scheme aims to install photovoltaics on more than 2,000 homes within an investment programme that will exceed 50 million euros.

Within the context of its "Smart City" strategy, Aradippou Municipality in cooperation with the Cyprus Cooperative Bank and the Larnaka Chamber of Commerce and Industry, has prepared a pilot programme aiming to provide loans with more favourable terms for the installation of photovoltaic systems on homes. This programme has secured 1 million euros for such loans, allowing for the installation of photovoltaics on 100 homes.

The programme went through a long process of interest rate discussions. Currently, the first batch of applications are being evaluated. Through its efforts, the Municipality has managed to connect to European Investment funds linked to Social Welfare and Economic Development and to Environmental Protection. While the programme is still at its beginning, it is expected to mature within the next 3-5 years. Aradippou aims to apply in order to receive additional funding from European Investment funds that will exceed 50 million euros for its overall investment programme in Clean Energy, which includes this installation of photovoltaics in more than 2,000 homes. One source for these investment funds is the European Fund for Strategic Investments (EFSI). The investment programme "Smart City Aradippou" has been selected by the Ministry of Finance of Cyprus and is being promoted to the EFSI. In addition to protecting the Environment, it is expected that these investments will strengthen the local businesses operating in the photovoltaics and solar energy industry and create new jobs. As talks with banks can take a long time to mature, good practice is to start as early as possible in order to identify the Bank (or Banks) willing to work closely with the Municipality to co-develop a soft loan scheme.

Relevance to Stanz:

- Interesting governance and financing structure for the installation of photovoltaics at households
- Utilisation of EU funding in combination with the banking sector for renewable energy investments by private households

Intelligent micro-grid at Wilspoldsried

Country: Germany

Powered by: Solar, Wind, Biomass, Biogas

A traditional Bavarian village (3,000 inhabitants) inspired one of the most progressive projects for renewable energy and micro-grid research.

In 1999, the municipality put in place a 2020 vision with three main areas of focus: Renewable energy and saving energy; ecological construction of buildings using ecological building materials (mainly wood-based); protection of water and water resources and the ecological disposal of wastewater. In addition to five biogas plants, 4 983 kWp of photovoltaics, 11 wind turbines and a hydropower system, the town also hosts several municipal and residential biomass heating systems and 2,100 m2 of solar thermal systems.

Together with the local energy provider and universities, the company Siemens tested the capabilities of the village's distribution grid in different scenarios. Thanks to a lithium-ion battery storage system, a diesel generator with vegetable oil operation, a backup diesel, a load bank, two controllable distribution transformers, a sophisticated measurement system, and a state-of-the-art communications infrastructure, the village's distribution grid has been turned into a smart micro grid.

The inhabitants of Wildpoldsried are now "prosumers". Their solar panels, windmills, and a biogas-driven combined heat and power plant produce more than five times as much electrical energy as residents consume. In 2015, production was 34,344 MWh, while consumption stood at 6,406 megawatt- hours. The villagers transfer their surplus into the distribution grid and thus provide the neighbouring villages with renewable energy. They also save 330,000 litres of oil a year - previously used for energy supply. Thanks to this project, the village makes around EUR 4.7 million in annual revenue.

The town's energy transformation has attracted a new tourism industry, which in turn, has inspired the construction of a sustainable energy training centre built with passive solar design. Wildpoldsried aspires to be a model for other towns that want to become climate friendly energy leaders and has received numerous awards for this effort. The next step for Wilspoldsried is to achieve 100% Renewable heat and transportation by 2020.

Following the introduction of a new feed-in tariff in Germany, under the Renewable Energy Source Act in 2000, it became economically viable for citizens, small businesses and entrepreneurs to partake in the renewable energy business, especially solar. The project success also lies in the determination of the Mayor, the fruitful cooperation between local energy providers and universities and the citizens' support to the initiative.

Relevance to Stanz:

- Existence of a long-term vision by the Municipality
- Similar project objectives aiming to self-sufficiency, distribution of surplus energy and establishing a role model for replication by other communities
- Interesting dimension related to the attractiveness of the village, connected to the construction of a sustainable energy training centre
- Strong political support and synergies between the community, researchers and citizens

Eliminating carbon and creating jobs at Sønderborg

Country: Denmark

Climate change is an important issue to Sønderborg's citizens (28,000 inhabitants). The entire area is involved in the vision of creating a CO_2-neutral growth area before 2029, creating and demonstrating new solutions, robust measurable CO2 reductions, new green jobs and a generation of talented young people.

ProjectZero is a public-private partnership created to inspire and drive Sønderborg's transition to a zero-carbon community by 2029, based on improved energy efficiency, conversion of energy sources into renewables and by creating participation of all stakeholders to reach the goal. In order to move toward the vision, the city has acted on different fronts: from citizen engagement activities, to educational programmes (for all ages) and green energy infrastructure development.

Sønderborg District Heating, in combination with massive absorption heat pumps and biomass burners, supplies more than 10,000 households, businesses and industrial customers in the city centre. Coupled with thermal solar heating facilities, biomass burners, bio-oil furnaces and other sources the network will be expanded to supply approx. 60% of households on the island of Als with green, CO_2-neutral district heating. By 2029, the project foresees the installation of several new onshore wind turbines and establishing an offshore large coastal wind turbine park on the north-east coast of the island of Als.

At the beginning of this programme in 2007, 82% of Sønderborg's energy consumption came from fossil fuels. By the time the second road map was prepared in 2015, this number had been reduced by 30%. Additionally, approximately 800 new green jobs were created between 2007 and 2013.

The success of this project is due, in part, to the inclusive approach taken and the strong focus on education and support for the different groups involved. For example, through group courses and workshops (Family-

Zero), Sønderborg's families obtained knowledge of key changes in their everyday lifestyle which could bring efficient results; both in terms of CO_2-reductions and economic gains. Through international and local partnership with industries, energy companies and municipalities, in Denmark but also abroad, Sønderborg manages to exchange best practice and develop new knowledge and ideas for next steps.

Relevance to Stanz:

- Existence of a long-term vision by the Municipality
- Interesting educational dimension complementing citizen engagement activities and conversion to renewables infrastructure

Co-designing low carbon public services

Country: Finland

Powered by: Solar

Website: www.ii.fi/en

Ii (10,000 inhabitants) is the fastest Finnish community in terms of CO_2 reduction. In October 2017 Ii's Innovative Low-Carbon Public Services project won the European Commission's RegioStars Awards (Energy Union: climate change category).

The total investment for the project was 297,526 euros, with the European Regional Development Fund contributing 208,267 euros through the Operational Programme "Sustainable growth and jobs 2014-2020 - Structural Funds Programme of Finland" for the 2014-2020 programming period. Citizens ideas and input on public services were collected at the very beginning of the project with the help of a service design team. A municipality map was sent to every citizen so that they could mark their favourite place in the area on it. In-depth interviews were conducted with individuals, sometimes even in their own homes. Sessions were held with young and elderly people to get their perspectives on how the municipality could be improved.

A strong emphasis was placed on finding energy-efficient and eco-friendly solutions to the problems facing the citizens. Following an electronic survey, to which almost 500 people responded, the decision was made to build the first cycle path proposed by the citizens in order to reduce traffic. All the public buildings of Ii are now heated with renewable energy, and electric cars are used by municipal employees for their business trips. A local EU Ecolabel was created by Ii to encourage businesses in the region to save energy. For a company to be awarded the label, they must promise to be more energy-efficient or accomplish an eco-friendly activity.

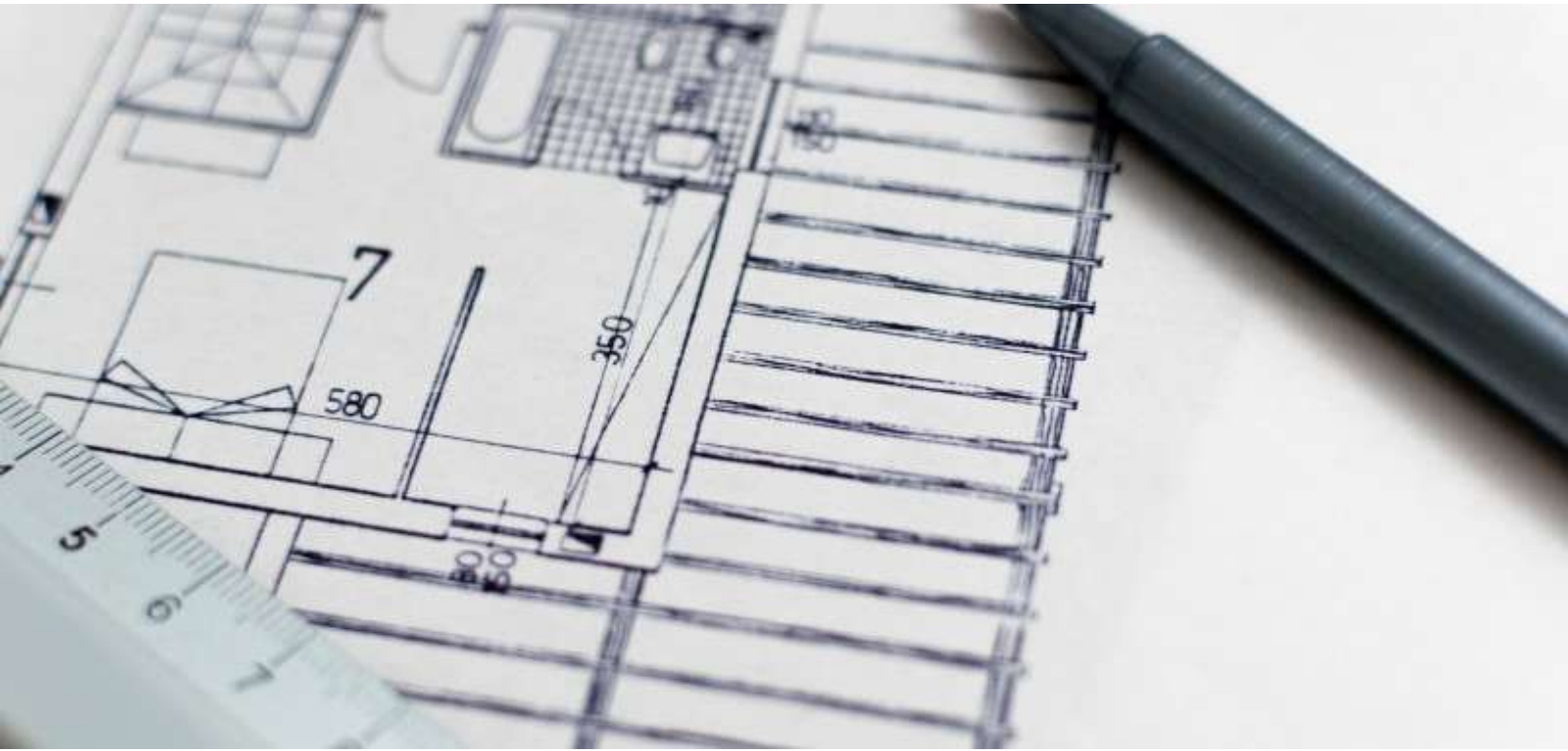
Since 2007, Ii has more than halved its carbon emissions. A total of around €600 000 is being saved each year. In addition, all schools and daycare centres are now participating in the Euronet 50/50 energy-saving programme. Twenty-six companies in the region have already received Ecolabels. Water, electricity and heating use is now being monitored through a new digital system, which is much more efficient than the manual system previously used. Currently 15 buildings are connected digitally with plans to connect all the main buildings of the municipality (100 buildings). The municipality of Ii is committed to reduce 80% of its carbon emissions by the year 2020, over 30 years faster than the EU climate target.

Besides an effective use of European funds, the integrated strategy adopted by Ii - foreseeing actions on different fronts towards the CO2 reduction goal, proved to be successful. Also, the municipality prepares its yearly energy efficiency action plan that is linked with the next year's budget.

Citizens of all ages were involved in the project, not only in order to discuss things to be improved but also in elaborating a shared strategy together with their policy makers. This created a strong feeling of ownership, making Ii's inhabitants proud of their city and avoided public resistance to the project. The municipality of Ii has a population of about 10,000 inhabitants, which is similar to about 80 % of all municipalities in Finland. About 250 municipalities in Finland could try to adopt similar strategies in their own areas.

Relevance to Stanz:

- Existence of a long-term vision and participatory processes supported by the Municipality
- Interesting EU ecolabel scheme for promoting energy savings by local businesses
- Interesting integration of energy efficiency action plan with the annual municipal budget



SuperHomes retrofitting programme

Country: Ireland

Website: www.superhomes.ie

A SuperHome is an energy efficient home that has implemented all the cost effective and sensible energy measures. These include insulation, air tightness and advanced ventilation. Heat and hot water is provided by renewable energy technologies such as solar photovoltaic panels and heat pumps.

There are several mandatory measures that homeowners must complete to receive financial support. The primary heating system must be renewable, such as an air source heat pump or pellet boiler and an advanced ventilation system must be installed. Finally, the building's airtightness must be improved. The homeowner can also obtain other non-mandatory measures such as window and door upgrades, insulation, a stove and solar PV arrays may also be incorporated.

Up to 50% financial support is available to local owners willing to implement retrofitting measures in order to make their home energy efficient. This is administered by the not-for-profit Tipperary Energy Agency that is funded by the Sustainable Energy Agency of Ireland, Electric Ireland and the EU. Manufacturers and contractors are hand-picked by the Tipperary Energy Agency to carry out the works.

Tipperary Energy Agency works with the various funding organisations to maximise the resources available to the homeowner. The basic premise is simple, for any home built before 2006 the aim is to bring the property to an A3 Building Energy Rating (BER) and achieve a 50 to 70 per cent reduction in energy bills. How to achieve this depends on the property and how cost effective the measures are.
First owners undergo an evaluation survey to understand the state of their house. Then they can decide to implement the suggested measures - such as insulation, air tightness and advanced ventilation. Heat and hot water is provided by renewable energy technologies such as solar photovoltaic panels and heat pumps.

Since the launch of the first pilot programme in 2015, over 70 houses have been retrofitted to a near A3 Building Energy Rating. The average net investment by homeowners in 2017 was €33 000. As well as average financial savings of €1 000 – €1 500 per annum on oil, homeowners benefit from living in a comfortable, healthier house with better air quality.

The main barriers to deep retrofit are the cost of completing the works and the homeowner's understanding of what to do and how to do it. Homeowners can be worried about the costs and unsure about what is value for money. Also they are afraid by a process that seemed long and complicated. On the contrary, homeowners that successfully completed retrofit works under the Superhomes scheme have reported significant improvement in the comfort levels of their house, feel they are contributing to the environment and have reduced heating bills.

Relevance to Stanz:

- Besides renewable energy infrastructure, the programme promotes retrofitting to increase energy efficiency in private households

Negotiated agreements for renewables

Country: Malta

In 2012, as part of the EU Covenant of Mayors, Qormi produced their Sustainable Energy Action Plan. One of their key actions to promote renewable energy was to negotiate agreement(s) with a number of suppliers of renewable energy systems in order to obtain preferential prices for use in buildings in the locality.

By entering into an agreement with a number of suppliers of renewable energy systems, Quormi local council is in a position to offer residents in its locality the possibility to purchase renewable energy technology at reduced prices. This model has already been employed in Malta and was very successful at the local level with a potential success rate of renewable energy systems on at least 50% of rooftops in the locality. Typical renewable energy systems may include, but are not limited to, solar (water and space) heating systems, photovoltaic systems and vertical axis (low noise) helical wind turbines which tend to be more aesthetic due to its design and quieter because of the lower blade tip speed. Obviously, this is subject to the approval of the Malta Environment and Planning Authority and/or other authorities as applicable.

The Council aims to have 3,239 solar water heaters installed on residential buildings by 2020. These are expected to offset electricity consumption which is currently the absolute majority source of energy for water heating. Electrical energy savings are aimed to reach 3,546.71 MWh annually with a corresponding emission reduction of 3,075 tCO_2. In addition, by promoting the installation of photovoltaic energy systems, the Council aims to have a good participation within the locality. The target installed capacity on residential rooftops by 2020 is 2,690 kWp. This should be able to generate 4 441.79 MWh offset a carbon dioxide emission of 3,851 tCO_2.

The island of Malta remains highly dependent on oil imports. Options for renewable energy are limited with tidal energy options being non-existent and wind and wave energy potential wind highly limited. Despite Malta's abundance of solar intensity, it is one of the most densely populated countries in the world and thus has a limited land mass on which to place solar installations. In this context rooftop photovoltaics provide the main potential source of renewable energy in Malta.

Currently a fifth of the residential building stock have a photovoltaic system. This excludes apartment blocks as residents do not normally have permission to place photovoltaics on the rooftops, and vacant land.

Relevance to Stanz:

- Interesting example of the municipality negotiating reduced prices with manufacturers and suppliers of renewable energy systems

Zeeland local climate fund

Country: Netherlands

Website: https://www.zeeuwsklimaatfonds.nl

The Zeeland Climate Fund is financed through the CO_2 compensations from major Zeeland companies, organizations and large event organisers. The fund seeks to offset CO_2 emissions in the territory of Zeeland by supporting projects that have an added value for the community and the regional economy.

Participants can fully or partially compensate for their own CO_2 emissions through the fund by contributing € 25 per ton of CO_2 emitted. Thanks to the fund, solar panels have been installed on roofs of municipal schools allowing cities to improve the sustainability of public buildings and local companies to go one step closer to climate neutrality. At national level, the Green Deal Carbon Market, of which the Zeeland Climate Fund is a partner, generally aims at reducing CO_2 emissions by at least 500 000 tons per year.

The Climate Fund has already received a record number of applications (on average 20 per year), including citizen-steered projects for energy sharing from solar installations. Some 50,000 euros were already contributed from the fund for a total investment pipeline of some 680,000 euros. Together, the projects will help compensate for some 3,500 tons of CO_2 emissions in the coming years!

An important element to keep in mind for regions wishing to copy the model is to count on the contributions of committed stakeholders. In this case, on top of the financial support from the Zeeland province some 35 other partners joined the initiative, including the Zeeland port, several municipalities, companies and event organisers. This is all the more relevant knowing that, in the future, the fund might not be able to cover for the expenses already foreseen, threatening the funding of solar community energy projects which benefit from a 10% cut on initial investment thanks to support from the fund.

Relevance to Stanz:

- Interesting example of CO_2 compensation scheme through a local climate fund, which can be established as an entity to fund public projects related to climate resilience and project scaling

Alaska Permanent Fund

Country: Alaska, USA

Shortly after the oil from Alaska's North Slope began flowing to market through the Trans-Alaska Pipeline System, the Permanent Fund was created by an amendment to the Alaska Constitution. It was designed to be an investment where at least 25% of the oil money would be put into a dedicated fund for future generations, who would no longer have oil as a resource. This does not mean the fund is solely funded by oil revenue. The Fund includes neither property taxes on oil company property nor income tax from oil corporations, so the minimum 25% deposit is closer to 11% if those sources were also considered. The Alaska Permanent Fund sets aside a certain share of oil revenues to continue benefiting current and all future generations of Alaskans.

Relevance to Stanz:

- Stanz could set up a similar fund to redistribute profits from sales of excess energy to the community, with an emphasis to the next generation. The scheme could include direct annual payments to all children of the community (supporting the demographics of the rural region), or negative municipal taxes (providing incentives for investment on renewables by residents).

Energy Safari: having fun with energy

Country: Netherlands

Adding a "fun" element can make an energy efficiency initiative more successful. The municipality managed to make its citizens more aware of their own energy consumption and is gently pushing them to act in order to reduce energy consumption.

The city of Zoetermeer decided to fight against climate change and biodiversity loss in order to become more sustainable and greener. It set the objective of becoming a CO_2 neutral City by 2040. That is why already in

2007 the first Sustainable Zoetermeer program was put in place. It includes ambitious goals with regard to climate/energy policy, healthy environment, mobility, biodiversity and sustainable purchasing.
The Energy Safari project is one of the initiatives launched by the municipality within this framework.

During an energy safari participants walk and view different houses in their neighbourhood. During this walk, thermal images of different properties are produced. An expert explains what is shown by the thermal image concerning the loss of heat/energy at each house. This provides direct insight into the energy consumption and heat losses of the home. By subsequently tackling these heat 'losses', the house can be made more energy efficient and the energy bill reduced. During the safari, employees of Reimarkt, a sustainable living business, are present to answer any questions. Citizens can request a thermal image of their home for the price of €10. The municipality co-finance the production providing €40 per thermal image.

The first pilot safari was organized in October 2013. Since then 45 safaris have been organized, with a total of 217 participating households. Each year there are 6-10 safaris in the months January to March, involving a total of about 50 participants. Every participant receives a small report by mail with the thermal image of their house and a short description. Thanks to the safari, interactions between neighbours have increased. Hopefully this will involve further uptake of house renovation and additional neighbourhoods taking part in this initiative thus fostering additional actions to renovate houses, and convince other neighbours to do likewise. The location of the neighbourhood is important for the number of participants. The municipality discovered that in the oldest neighbourhoods with the worst isolated houses, unfortunately participation was the lowest.

Relevance to Stanz:

- Such activities can increase awareness and project buy-in, by allowing citizens to make sense of the carbon footprint of their properties, incorporating gamification and experiential learning in engaging ways.

The Concept Distributed Energy Resources

Distributed Energy Resources (DER) produce and supply electricity on a small scale, enabling local generation and consumption of electricity. They are localized electric grids that can disconnect from the main grid to operate autonomously. Because they can operate while the main grid is down, microgrids can strengthen grid resilience, help mitigate grid disturbances, and function as a grid resource for faster system response and recovery. Solar DER can be built at different scales—even one small solar panel can provide energy.

Household solar installations are called behind-the-meter solar; the meter measures how much electricity a consumer buys from a utility. Since distributed solar is "behind" the meter, customers do not pay the utility for the solar power generated. One way the electric bill is determined is through **net metering**, where utilities calculate the total power generated by the customer's solar system and subtract it from the total power the customer consumes. Customers are credited for the amount of power they supply to the grid.

DER could fundamentally change the way the electric grid works. With DER, power is generated right where it is used and can be connected with other DER to optimize its use. Households and other electricity consumers are also part-time producers, selling excess generation to the grid and to each other. Energy storage, such as batteries, can also be distributed, helping to ensure power when solar or other DER do not generate power. Electric cars can even store excess energy in the batteries of idle cars. DER can also include controllable loads, like water heaters or air-conditioning units that the utility can use to shift power consumption away from peak hours.

While the grid was designed to generate power at large facilities and move it through the transmission grid to the distribution grid for consumption. Distribution grids are vulnerable to outages that can affect large regions and millions of people and businesses, particularly as a consequence of extreme, destructive weather events. When parts of the grid are equipped with DER, they can continue serving other loads on the same distribution network, meeting local needs with local generation. This is called **islanding**. Electrical systems that can disconnect from the larger grid, engaging in intentional islanding, are often called microgrids.

Small, off-the-grid electrical systems are not a recent invention. Ships, military bases, remote outposts, and communities around the world have long relied on local generation and electricity management to meet their energy needs. DER make microgrids a more widespread option, because the means of energy production are now more easily obtained and sited in communities. Community-scale microgrids may provide resiliency and backup during and after natural disasters and other disturbances, thus creating conditions of improved resilience, while reducing energy costs and even generating profits.

Without the larger grid to help stabilize the power supply, an islanded grid could damage connected equipment or injure workers who think it is disconnected from power. For this reason, many DER systems are programmed to detect islanding and disconnect from the grid if it occurs. Technology is advancing to manage the risks caused by islanding with better control software and to provide grid services. Beyond microgrids, some researchers are studying nanogrids—smart electricity systems on the scale of a single building.

Relevance to Stanz:

- The Energy Community in Stanz is essentially looking at establishing a micro-grid combining multiple renewable energy sources: biomass, micro-hydroelectric, roof-top solar and potentially wind

Further Reading:

- The U.S. Department of Energy's Microgrid Initiative

Blockchain in Distributed Energy Resources

What is a blockchain?

A blockchain can be compared to a big book of accessible and auditable accounts, registered on the Internet. It relies on a very large number of computer resources distributed around the world, called nodes that participate in its operation. In the case of a public blockchain, anyone can contribute; all that is needed is a computer of sufficient power and the execution of the associated code. All in all, blockchain technology is based on strong conceptual principles that naturally position it as the trusted technology par excellence.

Its decentralized architecture and the neutrality of its governance are based on the principle of consensus: relying on a very large number of independent contributors, it is decentralized by nature. This means that, unlike a centralized architecture where decisions can be taken unilaterally, it is necessary to reach a consensus or to manage to control more than 50% of the computing power of a blockchain (computing resources) in order to have an effect on the system. For example, any change in governance rules must first be approved by consensus by the contributors, who must then update the executed software code. The transparency of the algorithms offers better auditability: any transaction, any block, any governance rule is freely accessible and readable by anyone; as such, anyone can audit the system to ensure the proper functioning of the blockchain and the legitimacy of the transactions. The advantage is that it allows experts from the user community to scrutinize the code and raise the alarm in case of suspicion. The reliability of the system therefore depends on the whistleblowers. The underlying technologies are secure because the cryptographic techniques and methods of use guarantee that a blockchain cannot be altered, that the

transactions entered are authentic, even if they are issued under a pseudonym, and finally that the security of a blockchain is able to keep up with technological developments thanks to an adaptive level of security.

Application of blockchain technologies in Renewable Energy

The fact is that today blockchain technology is what the internet has been to the '90s. Several DER systems today explore, pilot and apply blockchain technology in the energy sector, looking into using it for the purpose of democratizing the electricity market, developing micro-networks, ie, small micro-grids and peer-to-peer systems for sharing and trading electricity among consumers. Inevitably, a whole science and sector is gradually emerging, dealing with frontier technologies such as big data, blockchain, smart contracting and cryptocurrencies.

The use of blockchains is not limited to energy communities or electrification of non-electrified areas. It can have implications for all types of peer-to-peer exchange that can be monetized and controlled by computer software tools. The use of blockchain technology can, for example, be applied to electricity recharging terminals, to allow the recording of electricity transactions and their accounting follow-up in complete transparency and without possible error.

Several initiatives are currently emerging. SolarCoin, a virtual currency that rewards solar electricity producers, is recognized by the International Renewable Energy Agency (IRENA). For every MWh of solar energy produced, 1 SolarCoin is awarded to the producer. These tokens can then be exchanged on a marketplace without intermediaries. Only supply and demand will determine the price of energy. For its part, the start-up Grid Singularity, in partnership with IBM and LO3 Energy, is implementing this technology for developing countries in areas with little or no connection to the distribution network.

Blockchain technology applied to energy could contribute to the development of energy communities in industrialized countries and to the electrification of areas where people do not yet have access to energy through a process of lateral electrification. Energy communities and lateral electrification thus converge through common technologies such as blockchains. The interest lies mainly in making the purchase and sale of electricity secure and transparent by eliminating direct monetary transactions. Other applications around the electric vehicle and the production of renewable electricity are also developing. Nevertheless, certain impediments relating to business models and regulatory systems must first be resolved, particularly through the various pilot projects that are emerging today. This is a prerequisite for the large-scale development of this technology.

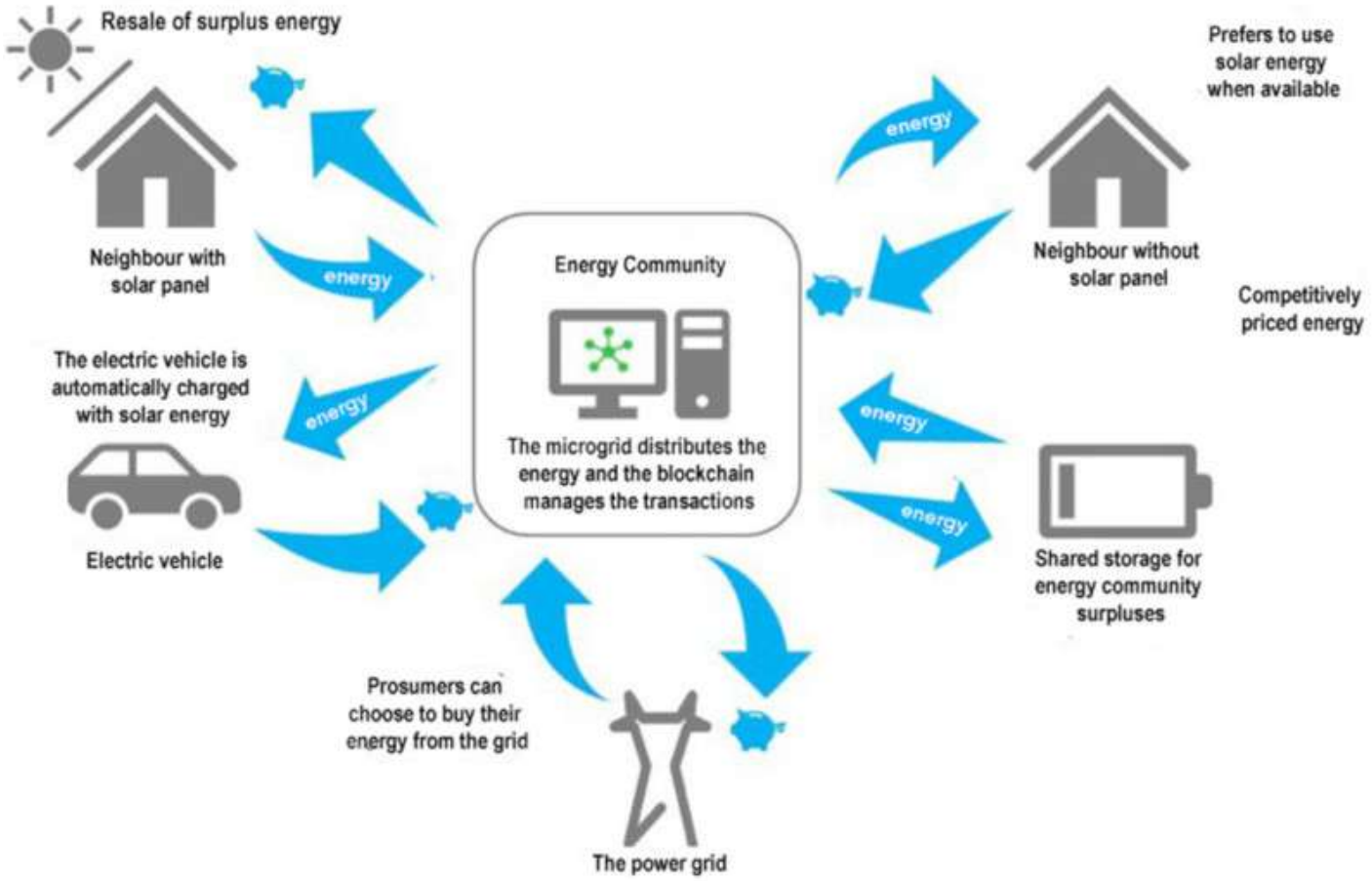


Fig 2: Schematic diagram of an energy community using blockchain technology. [Source: Chris Martin, How Blockchain Is Threatening to Kill the Traditional Utility, June 2018].

Technical and regulatory challenges

The application of blockchains to energy activities is still in its infancy. In order to move forward, various obstacles will have to be overcome. According to Digiconomist's Bitcoin Energy Consumption Index (BECI), each individual Bitcoin transaction consumes up to 275 kWh of electricity. The latest estimate of Bitcoin's total annual energy consumption is 29.05 TWh per year, equivalent to 0.13% of the world's total annual energy consumption. If the Bitcoin blockchain was a country, it would rank 61st in terms of global electricity consumption and would exceed, for example, the annual electricity consumption of a country such as Ireland. Therefore, the operation of blockchain-supported cryptocurrencies does have a demand on energy itself. This high electricity consumption of the Bitcoin blockchain is the block validation process, which consists of the solving of a mathematical problem (proof of work) requiring very high computational capacity. This validation process was written into the basis of the Bitcoin blockchain almost ten years ago and is not modifiable for this particular blockchain. However, since 2008, blockchain technology has undergone a meteoric evolution with the development of alternatives to the validation process used in the Bitcoin blockchain, which are much less energy consuming and faster. The new blockchains are and will therefore be much less energy consuming than the one associated with Bitcoin, often cited as an example.

In 2018, blockchain applications were in their early stages, and thus raised a number of uncertainties regarding their industrial implementation. Indeed, although the technology has very high potential, it is still in the development phase and many projects remain at the Proof Of Concept (POC) stage. In this context, the lack of a framework can be seen as both a challenge and an opportunity. While blockchain technology offers a viable option that is easy to implement in all types of networks, it also raises many regulatory and market economy issues. The incumbents, who are indirectly affected by this local peer-to-peer management, will have to face the multiplication of local energy markets in competition with the global energy market. These interactions could disrupt the market, as the energy produced is no longer directly linked to its price. In France, for example, self-consumption results in the non-payment of the TURPE (Tarif d'utilisation des réseaux publics d'électricité - a fee paid for use of the public electricity grid), which is necessary for the operation, maintenance and development of the power grid. Thus, if collective self-consumption were to increase thanks to blockchain technologies, it would be necessary to change the tariff system in order to guarantee the modernization of the public grid and its fair remuneration.

Can blockchain technology be trusted?

Smart contracts are one of the illustrations of the use of a blockchain to secure contractual transactions. These computer protocols automatically execute the terms of a contract; their objective is to satisfy contractual conditions, such as the terms of payment or delivery, but also those of confidentiality, and even the performance of reciprocal obligations. As a result, the digital and automated nature of the contract allows two partners to enter into a business relationship without the need for prior trust, an outside authority or central intervention. It is the system itself, and not its agents, that guarantees the honesty of the transaction.

Some of the most cited agencies fostering research and development of blockchain-based technologies for the renewable energy sector are:

Blockchain & Climate Institute

Website: https://blockchainclimate.org

With climate change threatening the livelihoods of humans and the earth they inhabit, there is an urgent need for a strong commitment to develop innovative solutions in a responsible and transparent way. The Blockchain & Climate Institute (BCI) is a progressive think tank providing leading expertise in the deployment of emerging technologies for climate and sustainability actions. As an international network of scientific and technological experts, BCI is at the forefront of efforts to create a sustainable and clean global future.

Developments in Distributed Ledger Technologies (DLT) and Artificial Intelligence (AI), amongst others, play a crucial role in addressing global sustainability challenges. However there remains a policy evidence gap among state and non-state-based institutions in the climate change policy community. BCI addresses this by enabling global technology transfers through the aggregation and distribution of new knowledge. This includes support for governments, inter-governmental and regional organisations in climate change policy development, furthering the deployment of emerging technologies (including blockchain) to combat climate change. In this way, a strong positive change is effected by BCI in enhancing state and non-state climate actions through targeted technological interventions, advancing governments and industries.

BCI employs a three-pronged approach in its mission:

1. To raise awareness among stakeholders in the international climate change policy community of the tremendous potentials of blockchain technology to considerably enhance climate actions at multiple levels;
2. To provide a 'super scaling' platform on which blockchain innovators experiment viable concepts with policymakers and corporate executives with a view to achieving the Sustainable Development Goals; and
3. To support stakeholders to create favourable conditions for the successful implementation of climate change policies using blockchain and emerging digital technologies.

Relevance to Stanz:

- Top level network to engage with for raising understanding, awareness and capacity for the application of blockchain technologies. Stanz can provide a case study, but also benefit from the wider advocacy environment.

SolarCoin

Website: https://www.solarcoin.org

SolarCoin is a reward currency protocol based on a low-carbon blockchain-based crypto coins acting as a marginal economic incentive for solar energy producers over the life of their facilities production. SolarCoin builds its network by issuing SolarCoin into circulation freely in exchange for proof of solar energy production. This represents a free economic incentive meant to accelerate capital spending for solar energy. It is believed an additional $10-20 / MWh reward is a useful economic incentive (in parts of the world, solar energy is produced at $23-30/MWh). At those price points, 40-70% of the Solar energy cost could be offset by SolarCoin's user network. The premise of SolarCoin is simple: if $100bn in value can be created by issuing a Bitcoin protocol into circulation for proof of work computation, why not issue $100bn of SolarCoin into circulation in exchange for proof of solar energy production.

As of 2018, a small network estimated at 4,500 users appeared to be trading below normal value ranges with a circulating economy of 48.9 million SolarCoins and a $0.05 price equating to a $2.4m market cap and protocol unit/node value of $540/node. At the same time, there were an estimated 20m solar facilities with 500GW of nameplate capacity globally. Assuming a 4-year average age and an estimated production, a 100% SolarCoin economy would see 20m producer participants and §2.62 billion SLR in circulation. The price point for SolarCoin based on the model above would range from $7.63 to $38.16 per SolarCoin. The linear nature of a currency procol's network effects means the $7.63 to $38.16 per SolarCoin price range is feasible by engaging 1% or 200,000 of the 20m solar participants. The current SolarCoin price on Carbonswap is $0.04.

Relevance to Stanz:

- Private micro-investors might want to monitor the value development of SolarCoil in case opportunities emerge as the blockchain technologies for renewable energy matures.

Further Reading:

- Gogerty, N.; Johnson, P; Network Capital (2018): Value of Currency Protocols Bitcoin & SolarCoin Cases in Context. Columbia Business School Research Paper No. 19-2. http://dx.doi.org/10.2139/ssrn.3281845

Grid Singularity

Website: https://gridsingularity.com

Grid Singularity is an open-source energy technology startup, democratising energy by placing the individual and the environment at the centre of the energy market. Grid Singularity simulates and operates grid-aware energy exchanges to enable local marketplaces that interconnect to form a smart, transactive grid, facilitating market participation by connecting aggregators and grid operators through an application interface.

Rebase Energy

Website: https://www.rebase.energy

Rebase Energy is an energy simulation and optimisation company developing two products: the Rebase Datahub and the Rebase Toolkit. The Rebase Datahub is an API including weather, market and asset data tailored to the energy industry and Rebase Toolkit is a software development kit that simplifies iteration and development of smart energy agents both for simulation and optimisation use cases.

The two energy technology startups are currently working to functionally integrate Rebase's open energy data map and library with Grid Singularity's open-source platform to simulate and operate local energy communities. This will enable individuals interested in local energy trading to evaluate the benefits of local marketplaces with a higher level of granularity propelled by artificial intelligence (AI), making informed decisions that account for weather and other factors.

Relevance to Stanz:

- Stanz could be a pilot site for testing and developing state-of-the-art decision making tools for efficient real-time monitoring of energy supply and demand aiming to facilitate better decision making regarding the micro-grid.

Exergy

Website: https://exergy.energy

Exergy is a data service powering the transition to smart grids, assisting researchers, policy makers and program designers in accessing data from Distributed Energy Resources. Through the platform, installers and manufacturers share data to support the design of new DER programs. In turn, new programs create new value streams for existing DERs and support deployment of new systems. Some of the applications of the data platform concern rooftop solar and storage, electric vehicle charging, smart thermostats and water heaters, among others.

On the Exergy platform, prosumers -generating energy through their own renewable resource- can transact energy autonomously in near-real time with consumers on the platform in their local marketplace. The Distributed System Operator (DSO) is granted access to consumer data like building management systems. Using price as a proxy, the DSO manages energy use, load balancing, and demand response at negotiated rates. When a charging station -public or private- or an electric vehicle has a surplus of energy, it is made available for purchase on the local network. Consumers can set budgets and be alerted to the availability via a mobile app.

Relevance to Stanz:

- Worth exploring the utilisation of such a data platform to facilitate exchange of information between different stakeholders of the energy community.

LO3 Energy

Website: https://lo3energy.com

The company works with utilities and retailers to deliver configurable digital tools that meet the demands of modern energy customers. Their technology platform, Pando, offers a simple way to account for local distributed energy resources and enable new incentives for customers. The marketplace is designed to directly connect energy providers to customers and customers to their community. Specifically, it offers:

- Configurations for flexible trading of energy or energy attributes, enabling consumers to source renewables from their local community.
- Metrics for market analysis with consumer and trade analytics and trading dynamics.
- Personal Energy Management feature, leading consumers on their own energy journeys, starting with valuable energy tools on a mobile application to learn about their energy profile and renewable engagement opportunities.
- Integration to third-party software connecting to different billing systems and energy devices powering the marketplace and streamlining customer experience.
- The deployment of the marketplace is simple (launched in 90 days) with a team of experts who partner with the energy community through every implementation stage from design collaboration, to test and turn up, and ongoing support.
- Built using blockchain technology to ensure personal and system data.

Relevance to Stanz:

- Worth exploring the utilisation of a platform like Pando to operate transactions within the community through an "alternative currency".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