Engaging Citizens via Social Innovations for the Energy Transition

*The **Global Forum on Sustainable Energy (GFSE)** is a neutral multi-stakeholder platform which is facilitating international dialogue on energy for sustainable development by taking into accounts the special interests and challenges of developing countries. GFSE aims at the establishment of a sustainable world energy system from a social, economic and environmental perspective.*

GFSE contributes to both international discourse and information dissemination on sustainable energy. The multi-stakeholder platform plays a crucial role in facilitating sustainable energy projects by bringing together donors, investors and project developers. Their interaction creates new opportunities and enhances existing initiatives in the field of sustainable energy.

Introduction

Social innovation can be defined as "the development and implementation of new ideas (products, services and models) to meet social needs and create new social relationships or collaborations. It represents new responses to pressing social demands, which affect the process of social interactions, and is aimed at improving human well-being. Social innovations are innovations that are social in both their ends and their means. They are innovations that are not only good for society but also enhance individuals' capacity to act".[1]

Such innovations can help tackle a number of environmental and energy challenges, especially in those areas where they also have social repurcussions (ex. health issues due to air pollution or resource depletion). The energy transition has already given rise to various forms of social innovation, including energy cooperatives, energy "prosumers" consuming and producing energy, shared mobility platforms, living labs and citizens' engagement initiatives. They are linked to new business models, participatory governance approaches, and innovative financing schemes, among others. They can contribute to making energy more sustainable, democratic, affordable and thus advance structural energy system transformations by putting people at their center. Social innovations are also useful in generating income for local communities and keeping money flows in local economies.

Additionally, social innovations have a multi-actor nature, involving contributions from consumers, citizens and organisations beyond typical energy suppliers. They are being used as means to achieve specific energy-related policy goals, for instance increasing social acceptance of new technologies and addressing neglected social dimensions of the energy transition.[2] As such, social innovations have become more prominent in innovation policies in many countries in the past few years. The United Nations Development Programme (UNDP) published a report titled "Social Innovation for Public Service Excellence"[3] back in 2014 that looked at ways social innovations could help provide solutions to public service challenges by improving existing forms of collaborative action and improving the inclusion of under-represented groups (ex. initiatives like the Barefoot College[4] or Patients Like Me[5]).

The energy transition has already given rise to various forms of social innovation, including energy cooperatives, energy "prosumers" consuming and producing energy, shared mobility platforms, living labs and citizens' engagement initiatives.

The European Union is currently working on ways to encourage the market uptake of social innovations as a way to stimulate the economy and create employment. Building on the strategy documents of the Innovation Union initiative (2010) and the Social Investment Package (2013), the EU is actively supporting entrepreneurs to increase the creation, uptake and eventual scaling-up of such innovations[6]. Some specific activities include the hosting of an annual European Social Innovation Competition[7] to raise awareness about social innovation to solve societal challenges, maintaining the Social Innovation Community[8] portal and offering direct funding to support social innovation. In the Lisbon Declaration (2018), the Social Innovation Community identified five priorities Europe should address in order to make social innovation a part of its long-term strategy:

1. "Making funding suitable for small-scale experimentation, spreading and scaling impact;
2. Enabling citizens and civil society to lead local change initiatives through community-led innovation;
3. Strengthening the capacity, skills and incentives for public officials and policymakers to support and draw on (citizen-led) social innovation;
4. Making public procurement an instrument of social innovation policy; and
5. Prioritising the spreading of social innovation to regions where it is needed most"[9].

It is necessary to examine examples of social innovations in the energy sector and, specifically, the enabling conditions that facilitate their emergence, their contribution to the development of new business models and greater acceptance of the transition towards low greenhouse gas emissions, climate resilient energy systems. Some of these social innovation examples are looked at in more detail in the remainder of this policy brief.

Renewable Energy Communities and Citizen Energy Communities in the Energy Union

Renewable energy communities based on open participation, which produce, consume, store, sell and share renewable energy, can make a significant contribution to the achivement of renewable energy targets. They foster citizen's participation and empowerment in decision-making in the renewable energy field. Energy communities can be an effective tool to increase public acceptance of new projects and mobilise private capital for the energy transition. Energy communities can also be a tool to increase flexibility in the energy market. Moreover, they trigger the development of new, innovative business models. Members of energy communities tend to be more positive towards an energy system change when they take part in collective, participative energy projects.[10] A number of benefits[11,12] arise from the participation of citizens and local authorities in energy communities, such as:

- local and sustainable energy supply,
- generation of local jobs,
- avoid the outflow of financial resources from the region,
- (partial) energy autonomy,
- citizens have control over energy investments by becoming co-owners of renewable plants,
- surpluses can be reinvested in the communities,
- citizen's empowerment for joint action with municipalities and local authorities to advance renewable energy and mitigate GHG emissions,
- technology preference for distributed energy sources (over centralized or large-scale RES installations),
- independence from large incumbents as well as active participation of citizens in the shaping of the energy transition and thereby increased local acceptance for RES,
- resilience to major events affecting reliability of electricity and gas networks, and
- energy communities can also play a role in addressing energy efficiency and energy poverty.

However, there are still a number of barriers to energy community development, including:[13]

- Lack of stable policy frameworks,
- Regulatory frameworks that do not allow or restrict self-consumption in a way that makes it economically unfeasible,
- Lenghty and complex permitting procedures,
- High grid conection costs,
- Lack of access to affordable financing,
- Lack of tailored support mechanisms or support mechanisms that do not allow communities to compete on equal footing with other actors for support,
- Lack of capacities in local authorities and communities to set up and execute renewable energy investment projects,
- Cultural barriers, and
- Not-in-my-Backyard (NIMBY) feelings: energy communities require that the local population accept that energy production takes place closer to home. Thus, energy production facilities become visible to the local population. However, active involvement of citizens in such projects normally reduces potential resistance to them.

Energy communities are very heterogeneous in terms of organisational models and legal forms. They can take the form of cooperatives, associations, limited partnerships, development trusts and foundations, among others. The most common type, however, are energy cooperatives, since the cooperative form is well suited to organising renewable energy communities. In Europe, there are already about 3,500 renewable energy cooperatives[14] and some European countries (e.g. Germany, Denmark) have a long-term history of community participation in renewable energy projects through cooperatives. Cooperative members typically expect only a moderate financial gain on their investment, and are likely to invest in activities that provide additional social and environmental benefits such as energy efficiency and cooperation with social organisations to address energy poverty.[15] Thus, the added value of the production remains within the cooperative and is invested in new projects chosen by the cooperative. The participation of local citizens and local authorities in renewable energy communities in Europe has resulted in a better local acceptance of renewable energy and access to additional private capital, which results in local investment, and greater participation by citizens in the energy transition.

Renewable Energy Communities (RECs) have been recognised by EU legislation as an instrument to encourage citizen's engagement in the energy transition and to achieve RES targets. The new EU renewable energy directive 2018/2001/EC (European Union, 2018)[16] provides a definition of Renewable Energy Communities and outlines the legal framework for their operation. According to the EU RES Directive, a Renewable Energy Community is defined as:

"a legal entity:

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

Member States shall ensure that renewable energy communities are entitled to: (i) produce, consume, store and sell renewable energy; (ii) share, within the renewable energy community, renewable energy that is produced by the production units owned by that renewable energy community; and (iii) access all suitable energy markets both directly or through aggregation in a non-discriminatory manner. The EU definition is currently being translated into national laws and EU Member States must provide an enabling framework to promote and facilitate the development of RES communities. Among others, EU Member States should ensure that renewable energy communities can participate in available support schemes on an equal footing with large participants. Other measures include capacity building for national and local authorities, training on technical and entrepreneurial skills for project developers and financial support mechanisms, for instance, green soft loans, interest rate subsidies and guarantee funds. Collaboration with municipalities and local authorities is necessary in order to develop measures in a bottom-up manner taking the communities' needs into account.

Denmark, which has a long tradition of renewable energy cooperatives, supports community participation in renewable energy projects through a number of measures:[17]

- The "option-to-purchase" scheme, which obliges wind energy project developers to offer financial shares in new wind energy projects to local citizens (both onshore and near-to shore wind projects).
- The "value-loss" scheme obliges RES project developers/owners to compensate local citizens for any lost property value linked to the realization of the project.
- The Green Support Scheme aims to improve municipalities' incentives for renewable energy development. Municipalities who approve new wind energy projects can apply for funding of recreational projects or natural conservation projects or benefit the local citizens in other ways
- The Guarantee Fund provides financial guarantees to the financial institutions that lend money to local wind energy cooperatives. In case the project is not realised, the guarantee fund covers the loss.

In addition, to the renewable energy communities defined by the Renewable Energy Directive, the European Union has also defined so-called the Citizen Energy Communities (CEC) in the new electricity market directive[18] as a legal entity that:

a) "is based on *voluntary and open participation* and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises;
b) has for its primary purpose to *provide environmental, economic or social community benefits* to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and
c) may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders."

An example of the national legal and regulatory frameworks for energy communities is the Greek law on energy communities: In 2018, Greece introduced a new law (Law 4513/2018) outlining the legal framework for energy communities and granting them financial incentives. The law defines energy communities as urban partnerships by local individuals, public and private entities and municipal/regional authorities with the aim of promoting social and solidarity-based economy and innovation in the energy sector, addressing energy poverty and promoting energy sustainability[19, 20].

Energy communities can produce, store, self-consume, distribute and supply energy produced by renewable energy source or high efficiency comnbined heat and power, as well as improve energy efficiency in end-use at local and regional level. The law emphasises the use of local energy resources to respond to local needs and enhance energy self-sufficiency in island municipalities, with special arrangements for very small islands. The law encourages participation of local actors while contributing to address energy poverty. Using this legal framework, cities have started to promote community participation in renewable energy projects. In some cases, these initiatives build upon previous experience with participatory planning in designing urban policies and community initiative programmes that helped integrating vulnerable groups into the urban development process.[21,22]

Examples of Energy Communities

As can be seen from the previous sections, energy communities can be formed through a number of ways and take several forms. Some examples of energy communities are briefly described below:

Edinburgh Community Solar Co-operative (ECSC) (Scotland)

The Edinburgh Community Solar Co-operative (ECSC) was formed in December 2013.[23] ECSC generates electricity from solar power at 24 host buildings across Edinburgh. Fundraising is achieved with a public share offer, giving priority to Edinburgh residents to become members of the co-operative by purchasing shares. Each year the Edinburgh Community Solar Co-operative assigns a portion of its proceeds to the Community Benefit Fund. Each of the ECSC host buildings can apply for a grant from the Community Benefit Fund for projects that help make host buildings more sustainable, alleviate energy poverty, reduce energy consumption and CO_2 emissions, and encourage behavioural change relating to sustainability or provide relevant community benefits.

SOM Energia in Spain

SOM Energia is a non-profit renewable energy cooperative located in Catalunya (Spain) with about 67,000 members, which started selling renewable electricity in October 2011.[24] The renewable energy was bought from the market and sold to its members. Thereafter, Som Energia started developing its own renewable energy projects to supply its members with renewable electricity at the generating cost of the power plant. Currently, the main activities of Som Energia are electricity commercialisation and renewables generation. Som Energia arranges for the administrative changes that are necessary to ensure that the energy consumed by its members is from a renewable source. The projects are financed thorugh members' investments.

SOM Energia is currently testing new business models for the provision of flexibility to the electricity grid through so-called demand response. Demand response refers to programs that encourage participants to make short-term reductions in energy demand, triggered by price signals from the electricity hourly market, in order to accomodate for the volatility of renewable energy sources. The development of demand response services incentivises consumers to be more active in the electricity market. SOM Energia plans to offer services as an aggregator that provides demand response. An aggregator is an energy service provider, which can increase or reduce the electricity consumption of a group of consumers when there is high demand for electricity. The aggregator then sells this flexibility in electricity markets. An aggregator can also operate on behalf of a group of consumers producing their own electricity by selling the excess electricity they produce.[25] Therefore, the aggregation offers an opportunity to exploit the flexibility potential of consumers and to facilitate their access to the market.

VIERTEL ZWEI: Wien Energie's Pilot Energy Community

Wien Energie, the City of Vienna´s energy supplier, works together with 100 residents of the VIERTEL ZWEI, an urban development area encompassing offices and residential buildings, to jointly develop smart mobility and energy concepts.

VIERTEL ZWEI residents can trade self-generated solar electricity from roof-mounted PV systems with each other, thus enabling the locally generated electricity to be distributed in line with demand.

Residents trade self-generated electricity with each other through so-called 'smart contracts' by means of blockchain technology, namely a digital, decentralised database for transactions between one or more parties located in many computers, which allows for transparency and security in billing transations. Residents can also sell unused electricity on the electricity exchange, using the blockchain technology, or store it in batteries, allowing for increased self-consumption and reducing the electricity drawn from the network during times of peak electricity demand.[26]

Ecopower cvba in Belgium

Ecopower cvba is a Belgian renewable energy sources cooperative with about 48,000 members. The cooperative issues shares and invests in renewable energy production installations such as wind turbines and solar PV. All citizens are eligible to join the cooperative and after purchasing a share they become co-owners of the installations. Members are also given the opportunity to buy renewable electricity from local sources at a fair price. Ecopower uses the proceeds of renewable energy to finance the retrofit of public and private buildings, allowing the cooperative to serve more citizens with the same amount of energy.

Together with the city of Eeklo, ecopower is building a district heating system that uses waste heat to replace fossil fuel heat. The district heating project has a commitment to implement energy efficiency measures. A number of stakeholders participate and invest in the project, including more than 30% direct participation of citizens. All actors have the same return on investment, independent of their role and the amount they have invested and also have a say in every aspect of investment and operation. The business model focuses on return on investment for the project as a whole and not only for heat sales. As such, it allows overcoming the typical reluctance of district heat supply companies to implement energy efficiency measures because they diminish heat sales.[27,28]

MeerEnergie: Cooperative for Heat Recovery from Data Centers in Amsterdam

Data centers have a significant potential in the heat marketplace through the transfer of excess heat, which is released when the servers are cooled. The non-profit MeerEnergie (More Energy), a cooperative founded in Amsterdam in 2015 by local residents, has implemented a heat network project to transform waste heat from data centers in the Science Park of Amsterdam into heating for local households, thereby replacing natural gas. The project has the potential to provide heating and hot water for about 5,000 homes. Water is transported via a pipeline to the neighbourhood where a district heat pump raises its temperature to 70°C before transporting it further through the heating network.

The MeerEnergie cooperative is an example of an innovative model of heat consumption, which relies on collaboration with multiple local actors. The project is being implemented in cooperation with Equinix, a data center company, Alliander, an energy company that develops and operates energy networks, as well as the municipality and housing corporations. Equinix agreed to release the heat without costs and the cooperative strives for a heating network that is cost-neutral for residents. The cooperative gives neighbourhood residents, companies and housing companies the possibility to become co-owners of the heat network. Local residents have different options to participate: some members can invest while other members only participate by purchasing heat.[29,30]

Social Living Labs: Valuing Local Knowledge, Enhancing Engagement

The energy transition and climate action require considerable changes in the behaviour of individuals, communities and public and private organisations, for instance related to energy and resource consumption. Addressing these issues requires research and experimentation on behavioural, social and cultural change. One of the vehicles to address these issues are "Living Labs", a further example of a type of social innovation, that will be looked at more closely below.

Living Labs can be defined as "user-centred, open innovation ecosystems based on systematic user co-creation approach, integrating research and innovation processes in real life communities and settings".[31,32] Living Labs represent new models of organizing collaborative innovation processes by involving diverse actors, such as citizens, research organisations, companies, cities and regions to test and validate innovations and/or to tackle current societal challenges. They focus on citizen engagement, iteration and self-reflective learning.

Energy communities can be an effective tool to increase public acceptance of new projects and mobilise private capital for the energy transition.

Living Labs allow fostering innovation through the application of both local knowledge and scientific expert knowledge to real-world problems (e.g. energy use). Living Labs have been used, for instance, to examine everyday practices of people in their homes and related energy use (e.g. reducing laundry cycles, and lowering indoor temperature). These living labs have demonstrated possible ways of reducing energy use through behavioral change, by allowing people to question their usual practices and try out different ways of doing things.[33] Living Labs have also been used as testgrounds for apps tracking the individual CO_2-footprint. In this case, the Living Lab helps establishing the baseline behaviour of the test groups, understanding their levels of environmental awareness and attitudes as well as evaluating perceived changes in the behaviour of participants after using the app for a given period of time. Living Labs have proven useful to gain insights on the effectiveness of approaches that intend to support people in making more environmentally-friendly decisions.[34]

Another example is the use of so-called city labs to test new schemes to make energy use better understood and more efficient.[35] Within the EU SONNET project, the city of Warsaw, for example, has created a city lab with focus on the energy consumption patterns of vulnerable households and public buildings, with participation of the municipal administration, users and researchers.[36] The city lab works with childcare homes and municipal agencies to increase energy efficiency. It also illustrates the connection between energy consumption and daily routine of the users of building spaces, collaboratively exploring ways of changing people's perceptions and habits regarding energy use, using training and direct feedback mechanisms.

Living Labs to tackle energy poverty

Living Labs have also been used to tackle energy poverty in urban and rural areas.[37] An example is the living lab implemented by the STEP-IN project in the Great Manchester Area. Within this living lab, public engagement and knowledge exchange activities conducted included focus group meetings, energy cafes and energy advisor visits to households. The lab helped identify energy, health and housing issues faced by local residents. The provision of energy advice helped local residents reduce energy consumption through small, low-cost energy efficiency measures and gives them orientation about support measures and institutions that can help them reduce energy poverty. However, the labs have also made evident that only focusing on behavioral measure is not enough to address energy poverty, which requires a systemic approach encompassing energy, social, housing and economic policies targeting the root causes of vulnerability and social inequalities.

Living Labs for Citizen Science on Air Pollution Research

Citizen Science has the potential to engage the public in an inclusive manner. Citizen engagement in research activities can encourage environmentally-friendly action and empower citizens to play an active role. It can also accelerate and enable production of new scientific knowledge, increase public awareness about science, and increase prevalence of evidence-based policy making.[38]

The iSCAPE project involves citizens in data collection about air pollutants using low-cost technology kits and engage them in conversations about local policies. iSCAPE promoted hands-on methods to learn about environmental issues and contribute to potential solutions. Through an online platform (www.smartcitizen.me), near real-time-data collected by citizens is available online. The transparency and collection of open data enables citizen scientists to share findings, learn from each other and develop a community around the topic of air pollution.[39]

"SIMmobil"

"SIMmobil" is a mobile urban living lab in public space, implemented in Vienna, Austria within the EU funded Horizon 2020 Smart City Project Smarter Together.[40] The project is part of the Smart City Framework Strategy adopted by the city council in 2014, which has quality of life, social inclusion and citizen engagement as key aspects. Smarter Together focuses on a holistic approach to social and technical innovations for a liveable district, including co-creation with citizens. The project demonstration area is a neighbourhood in the city of Vienna with a total of 21,000 inhabitants. The population is culturally very diverse and earns rather low wages compared to the average of the city. As part of an urban renewal area project in this neighbourhood, the population will benefit from smart project solutions in the areas of building refurbishment, energy, e-mobility and information and communication technologies.

One main concern of the project is how to communicate smart city innovations to the public and how to reach out to citizens of disadvantaged neighbourhoods to involve them in the process.[41] The SIMmobil is an information vehicle that is on the move in the district and invites all residents to actively help shape the neighbourhood. In addition to advice on living, information on the demonstration measures and consultation on "smart" topics in the project area, the SIMmobil offers smart hands-on activities and topics relating to building renovation, mobility and energy. There are several formats SIMMobil Kids targetting children and youth to convey smart topics in a playful manner (e.g. charging a mobile phone with a bicycle, e-bike sharing), informing them about how city development works and discuss topics of importance to them such as daily school life.

Shared Mobility

Shared mobility is a technology-enabled social innovation, which refers to the shared use of vehicles, bicycles, buses, or other transportation modes. It allows users to access transportation services on an as-needed basis and encompasses a variety of transportation modes including carsharing, ridesharing companies, and microtransit.[42] The spread of smartphones, social media and web platforms, together with sharing economy practices and attitude/values changes of citizens have contributed to the development of shared mobility business models in several countries. Shared mobility is an alternative to the ownership of individual private vehicles and can offer options to improve transportation services for different target groups, including underserved low-income populations, such as low-income households without cars and residents of peripheral city suburbs with inadequate public transport service. Shared mobility could help improve occupancy rates and increase the utilisation of assets. Shared vehicles often have a higher utilization, providing benefits on fuel consumption, emissions and costs of transportation. Therefore, shared mobility can lead to benefits in terms of energy efficiency, congestion, air pollution and GHG emissions. Additionally, shared mobility services offer potential for a shift towards e-mobility. If based on e-mobility, the contribution of shared mobility to energy efficiency, reduced air pollution and GHG emissions can be substantially larger. Several national governments are starting to set targets for shared mobility companies to convert part of their fleet to electric vehicles and municipal governments are introducing incentives to the use of electric vehicles, but several issues remain to be solved such as profitability of shared mobility business models based on electric vehicles and charging infrastructure. Furthermore, shared mobility is an option to improve transport options and accessibility. In the short term, shared mobility services have been afected by the COVID-19 crisis, given that perceived health safety is low, but the potential remains significant. In the long term, the combination of Autonomous driving, Connectivity through the Internet-of-Things (IoT), Electrification and Shared mobility (so-called ACES) can accelerate the uptake of shared mobility options.[43] These technologies provide opportunities to improve mobility and reduce car ownership, car traffic and parking needs, but only if they come as shared fleets integrated with public transport.[44]

Some examples of new projects and initiatives in this field are described below:

Shared Mobility Cooperative Mobicoop in France

Mobicoop is a cooperative in the field of shared mobility (car-pooling, car sharing) founded in 2011 in France, which has about 20,000 members.[45] Its objective is to promote electric car sharing services and reduce associated emissions as well as address lack of mobility services. Mobicoop buys electric cars, which are charged with renewable electricity, and rents parking spaces in cities to offer electric car sharing services. The cooperative ensures that shared mobility solutions are available to all (people with disabilities, the elderly, low-income population and people in rural areas).

Car-sharing Service Cambio in Germany

Cambio is a for-profit car sharing operator that offers car sharing services with a defined pick-up and return station in Bremen and other German and Belgian cities. Its car sharing services are part of the local public transport system of the city of Bremen and members have access to public parking spaces. Car sharing is, in this case, not treated as a stand-alone measure, but is embedded into overall urban development, environmental protection and transport strategies of the city.[46] Its development has been made possible through a combination of strong political commitment, policy packages from the city government, synergies with the public transport system and other service providers, environmental awareness of the citizens, a cultural shift towards car sharing and a sound, continuously evolving business model.

Shared Mobility in India

India is experiencing a fast adoption of shared mobility services in many cities, as consumers are increasingly becoming aware of the cost of car ownership (e.g. insurance, repair costs and rising fuel prices). Shared mobility services include car sharing, car pooling, electric vehicles sharing, bike sharing, ride hailing etc. A number of companies are operating in India in this business space and this has led to a strong competition and a number of innovative business models.[47] While some companies have started to introduced electric vehicles, e-mobility has not been profitable for shared mobility platforms so far.

India is uniquely positioned to leapfrog personal vehicle ownership and has started to put in place supportive policies and regulatory frameworks for shared mobility and digitalisation.[48] The high penetration of smartphones and internet connectivity, a raidply increasing demand for mobility, a large share of young population and a culture of entrepreneurship are favourable conditions to the spreading of shared mobility. On the other hand, a number of barriers need to be overcome. These are related to the adaptation of legal and regulatory frameworks to accomodate new business models, lack of awareness of the environmental costs of private car ownership, lack of adequate standards for data handling and data sharing and lack of infrastructure. As a part of the sustainable transportation strategy, the government of India has plans to order ride-hailing companies Ola and Uber, which are the main market players in the country, to convert 40% of their fleet to electric by April 2026.

Other Forms of Citizen Engagement

In order for a full energy system transformation to take place, wider social acceptance is needed on the local level to further deploy renewable energy technologies and solutions. A number of business models and new concepts to increase citizen engagement are being developed to take advantage of the energy transition:

Prosumers

Prosumers are generally defined as „electricity consumers that produce part of their electricity needs from their own power plant and use the distribution network to inject excess production and to withdraw electricity when self-production is not sufficient to meet own needs“[49]. Prosumers can also provide demand response services to the grid, for example by shifting their energy consumption to off-peak hours with lower tariffs, including through aggregators as well as storage services through batteries and, in the future, possibly electric vehicles, and energy conservation. They are agents that support energy democracy, moving away from a few energy companies monopolising access to electricity towards a more active participation of consumers in the market and their emergence can facilitate a transition towards a sustainable energy system.[50]

The rise in the number of prosumers in some countries has been facilitated by the fall in the cost of decentralised renewable energy technologies, especially solar PV panels, as decentralised energy systems facilitate the process of placing consumers at the centre and empowering them. However, prosumers still face significant obstacles including legal restrictions, disproportionate administrative procedures and tariffs that do not provide them with incentives. Legal and regulatory frameworks have to be adapted to allow the participation of prosumers in the electricity markets, generating, storing and/or selling their own electricity, while safeguarding inclusiveness and transparency.

A number of measures addressing, among others, the following aspects[51] are necessary: providing consumers with clearer electricity bills displaying energy costs, network charges and taxes/ levies; spreading the use of smart metering; promoting energy demand management by consumers; facilitating the participation of aggregators, energy service providers which group together consumers in a platform to offer demand response, in the electricity market and promoting consumers' engagement with an aggregator; and promoting storage technology and adequate price signals for electricity storage.
Moreover, enabling prosumers to participate in the electricity market requires a careful management of the electricity distribution grids and clear price signals throughout the day to avoid overloads and facilitate network optimisation. This can be achieved through improved information and communications technology (ICT), smart meters and more flexible distribution networks.

Peer-to-Peer (P2P) Electricity Trading

Peer-to-peer (P2P) electricity trading is a new business model, based on an online marketplace where consumers and producers trade electricity directly, without the need for an intermediary, or indirectly through a certified third-party market participant, such as an aggregator. It allows prosumers or renewable self-consumers to trade excess electricity generated for instance in small-scale solar PV installations or wind tubines in farms directly with other consumers.[52] P2P trading platforms, governing the automated execution and settlement of the transactions, offer a marketplace for prosumers to trade the renewable energy generated at a better price, encouraging the deployment of distributed generation and allowing consumers to select and prioritize from which generators to buy electricity and influence the price at which they buy electricity.[53] In P2P electricity trading, prosumers can either purchase or sell electricity. A P2P trading model can be established among neighbours within a local community for instance based on an isolated mini-grid, as well as on a larger scale, among various communities, based on the main electricity distribution system.[54]

A futher example of peer-to-peer trading is Piclo, a digital platform in the UK launched in 2015 in partnership with the electricity supplier Good Energy. Piclo is a match-making service for local energy markets, matching electricity customers with neighbours that produce electricity through solar PV panels. Piclo is lowering barriers for individuals, communities and businesses with solar panels and batteries to trade peer-to-peer and provide balancing services to the local electricity grid.[55]

Another example is the Austrian platform „our power“, which operates a matchmaking service betwen owners of local renewable energy plants and local consumers in a particular region. Once a consumer provides information about the location of his/her home, he/she receives an offer with a renewable power mix from plants located in the region where he/she lives. This power mix complies with certain ecological criteria. The platform allows money flows to be kept within the region.

Citizen Engagement in the Development of the Decarbonisation Roadmap of Grenoble

The city of Grenoble in France has developed a roadmap for increasing the share of renewable energy, improving energy efficiency and reducing GHG emissions, including targets for the years 2030 and 2050. The roadmap emphasizes thermal refurbishment of existing residential buildings, and the decarbonisation of its heating sector and includes a ban of coal and progressive phase out of fuel oil boilers.

During the development of its roadmap, the Grenoble metropolitan area launched a three-stage citizen participation process so that citizens and local stakeholders could gain ownership of the plan. Grenoble has a citizen engagement charter, which enables citizen participation process. Through the charter, all citizens could submit their ideas and activities for contributing to the achievement of the roadmap.[56]

A wide variety of stakeholders provided inputs to the roadmap, e.g. local authorities in the metropolitan region, the citizens' panel energy users committee, the local urban development agency, energy authorities, researchers, the air energy climate plan committee, distribution network operators as well as the local energy and the climate agency. The citizen's engegement process allows for sharing responsibilities among all the local players involved. As part of the process a public energy committee was established in order to oversee the successful implementation of the roadmap.

Green Participatory Budgeting in Lisbon

Lisbon has a strong tradition with citizen engagement. In 2008, Lisbon was the first European capital to adopt a participatory budgeting process. In participatory budgeting, citizens have effective decision-making power over a portion of the municipal budget. Participatory budgeting has been refined over the years to make it more inclusive and to further encourage citizen participation. Since 2019, participatory budget has been labelled as 'green', meaning that the budget is destinated to fund project proposals with the aim to contribute to sustainability and climate change mitigation and adaptation.[57] Citizens can submit proposals for the development of project in the city, and citizens vote on projects that they want to see included in the Lisbon City Council Activity and Budget Plan the following year. Citizens' proposals are analysed by the municipal services or by the Parish Council. Selected projects on sustainability and climate action are then integrated into the city's Participatory Budget, called the Lisbon Climate Citizenship Commitment. Besides encouraging citizen's engagement for climate mitigation and adaptation, the process also contributes to civic education by enabling citizens to integrate their personal concerns, understand the complexity of problems and develop attitudes, skills and participatory practices. Additionally, this initiative promotes adapting municipal policies to human and environmental needs and increasing the transparency and accountability of municipal activities.

Wien Energie Citizen's Participation Models

Wien Energie, the energy supplier of the city of Vienna, allows citizen´s participation in power plants that Wien Energie plans, builds and operates (solar PV since 2012 and wind power since 2015). There are two models for participation:

Sale-and-Lease Back Model: Citizens are allowed to purchase a share of a power plant (for example solar PV panels). Once they invest, participants receive a contract, with a minimum duration of 5 years, through which they become co-owners of the power plant. Wien Energie leases the PV panels back from the citizens. The citizens receive a yearly return on their investment. The returns are paid directly to the bank account of the citizens involved. At the end of the lifetime of the PV panels, Wien Energie buys them back from the participants.[58]

Shopping Voucher Model: Participants buy a voucher package and have a contract for 5 years. Participants receive shopping vouchers every year by way of remuneration, which include a return on the initial investment. They can choose between vouchers from a supermarket chain or so-called "energy" vouchers, which they can use to pay energy bills.

Going Forward

Energy systems are undergoing a significant transition and actors involved are changing their roles in the generation, transport, storage and consumption of energy. As part of this process, social innovations are emerging, which enable the participation of citizens in the energy transition in different forms and contexts. They are being used as means to achieve specific energy-related policy goals, for instance increasing social acceptance of new technologies and addressing neglected social dimensions of the energy transition. Various forms of participation – some of which were already described in the sections above - are emerging.

Decentralised renewable energy technologies and storage have enabled the creation of energy communities. Community energy involves a wide range of collective actions that foster citizens' participation in the energy system. It offers an option for consumers to be involved in producing, consuming, storing or sharing energy. Energy communities focus on providing affordable energy for their members or shareholders and can also advance energy efficiency and reduce energy poverty. Energy communities can be an effective tool to increase the public acceptance of new projects and mobilise private capital for the energy transition. Energy communities can also be a tool to increase flexibility in the energy market and facilitate the introduction of demand response. Moreover, they trigger the development of new, innovative business models. Energy communities have delivered economic, social and environmental benefits to the communities where they are established. Still, a number of barriers must be overcome to facilitate the widespread implementation of energy communities, for example by creating enabling policy frameworks, designing financial support instruments, providing capacity building for local authorities and project developers, and developing awareness raising programs for citizens.

Although energy communities have been mainly developed in Europe, there is also a significant potential for community energy in developing countries. Purely commercial companies are not always suitable to provide clean energy services to low-income customers, since they require larger profits to satisfy commercial debt providers. Market rules, incentives, and regulatory policies are inadequate to advance new RES technologies in low-income markets. Moreover, the capacity of technical service providers, project developers, and nonprofit intermediaries to reach underserved communities is insufficient to address the challenges at hand. Renewable energy communities with participation of municipalities, citizens, cooperatives and local companies could fill the gap and play an important role in providing renewable energy services to the low-income population.[59] However, a lack of adequate national policy and regulatory frameworks, capacities, workforce skills and funding often make it difficult, for citizens and municipalities to become involved in the energy sector. One particular initiative working to fill this gap is the Green People's Energy for Africa Initiative of the German government. This initiative aims, among others, at providing capacity building and funding for municipalities, and developing new vocational training programs in several African countries to generate their own energy.[60]

Prosumes can play an important role in energy markets. Prosumerism enables people to become more self-sufficient, to generate income and can help them choose environmentally benign energy technologies. Electricity prosumers, for example, are consumers that generate their own electricity and inject excess production into the grid, thus actively participating in the electricity market. Empowering citizens and local communities as prosumers not only helps to speed up the transition towards clean energy systems, but also generates benefits for the communities themselves.

Empowering prosumers, however, requires policy and regulatory frameworks that allow them to self-generate, self-consume, store their electricity and sell it to the grid without facing barriers.

Living Labs allow to foster innovation through the application of both local knowledge and scientific expert knowledge to real-world problems (e.g. energy use). For instance, by helping gain understanding of the levels of environmental awareness and attitudes of different social groups as well as evaluating perceived changes in the behaviour of participants related to issues such as energy efficiency, energy poverty, air pollution etc. However, the labs have also made evident that only focusing on behavioral measure is not enough to address, for instance energy poverty, which requires a systemic approach encompassing energy, social, housing and economic policies targeting the root causes of vulnerability and social inequalities.

The emergence of the sharing economy, which provides consumers with access to goods and services through peer-to-peer sharing in community-based online services, has also led to several social innovations. One example is shared mobility, which refers to the shared use of vehicles, bicycles, buses, or other transportation modes. It allows users to access transportation services on an as-needed basis. It encompasses a variety of transportation modes including carsharing, ridesharing companies, and microtransit. Although shared mobility services have suffered a setback during the COVID-19 crisis, due to low perceived safety, shared mobility represents - in the long run - an alternative to the ownership of individual private vehicles and can offer options to improve transportation services for different target groups, including underserved low-income populations, such as low-income households without cars and residents of peripheral city suburbs with inadequate public transport service.

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