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Community energy solar deployment: weaving social and technical innovation

REScoop.eu's response to the call for evidence on innovative forms of solar energy deployment

Introduction

Europe's Green Deal aims to put citizens at the heart of the energy transition by ensuring fairness and inclusiveness. This follows the Clean Energy for All Europeans legislative package (CEP), which acknowledges 'active customers', 'renewables self-consumers', 'renewable energy communities' (RECs), and 'citizens energy communities' (CECs) as distinct market actors in the energy transition. The second generation EU legislation for energy communities, including the REPowerEU Package, the Fit for 55 Package and the revised Electricity Market Design recognize the important role energy communities can play in a lot of different activities in the market, including their contribution to renewable projects and solar deployment.

More specifically, the high potential and contribution of energy communities in the mainstreaming and accelerated deployment of solar energy is recognized in the EU Solar Energy strategy, which thus puts in place an objective for Member States to set up at least one renewables-based energy community in every municipality with a population higher than 10.000 by 2025. In addition, such strategy acknowledges the social benefits that energy communities bring forward and highlights that Member States should ensure that energy poor and vulnerable consumers have access to solar energy, e.g. through social housing installations, energy communities, or financing support for individual installations.

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Consequently, Member States need to ensure that their national legislation on energy communities and renewables planning contribute towards the delivery of the Green Deal and that local actors, including energy communities, have a fair chance to develop their projects and promote technical, but also social innovation. The Commission should, therefore, guide Member States so they can comply with the requirements under the CEP and the EU Solar Energy strategy and promote the development of energy communities at the national level, recognizing the socially innovative elements they bring forward.

The EU has determined that energy communities are indispensable for a successful, fair and accelerated energy transition

The Commission based its proposals for a new EU framework for energy communities on the premise that acknowledgment and support for particular forms of citizen ownership and involvement in the market is necessary to successfully transition Europe to a clean, decarbonised energy system. In doing so, the Commission noted the significant potential of community ownership of renewables to contribute to a clean energy transition in Europe.[1] In its Impact Assessment, the Commission noted in particular that while citizens in a few Member States have had the opportunity to enjoy the benefits of community ownership of renewables, most citizens across Europe have not benefited from such opportunities.[2]

Directive 2018/2001 (Recast Renewable Energy Directive, or RED II) acknowledges that RECs add value in many different ways, including enhancing local acceptance of new renewables projects, increasing the amount of capital available for local investment, choice for consumers, and greater participation by citizens in the energy transition.[3] The Directive also notes that RECs help address socio-economic issues such as energy poverty, and allow groups like vulnerable consumers and tenants to actively participate in the energy transition.[4]

The CEP explicitly acknowledges the unique characteristics of energy communities and the need to mitigate challenges they face operating in the market. Directive 2019/944 (The Electricity Directive) states that "*Citizens energy communities constitute a new type of entity*

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[1] CE Delft (2016). *The Potential of Energy Citizens in the European Union*. This study found that half of EU citizens – including local communities, schools and hospitals – could be producing their own renewable electricity by 2050, meeting 45% of their energy demand. Available at: https://ce.nl/wp-content/uploads/2021/03/CE_Delft_3J00_Potential_energy_citizens_EU_final_1479221398.pdf.
[2] Commission (EU) (2016). Impact Assessment Accompanying Proposal for a Directive on the Promotion of the Use of Energy From Renewable Sources (Recast). SWD(2016) 418 final, Part 1/4, p 78.
[3] Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources (recast) OJ L328/82, 21.12.2018 (Recast Renewable Energy Directive), Recital 70.
[4] Recast Renewable Energy Directive, Recital 67.

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due to their membership structure, governance requirements and purpose."[5] Furthermore, the RED II notes that the specific characteristics of RECs, including size, ownership structure, and their number of projects "*can hamper their competition on an equal footing with large-scale players.*"[6] It follows by highlighting that measures to offset disadvantages relating to specific characteristics of local RECs include enabling RECs to operate in the energy system and easing their market integration.[7]

In addition, along the categories highlighted by the EU Solar Strategy, energy communities participate in several innovative deployments of decentralized photovoltaic technologies across the continent, including agri-pv and building-integrated PV. However, the innovation in the case of such initiatives lies mostly on the social benefits they bring forward corresponding to the unique value proposition that Europe has been creating for its citizens – a fairer and greener society with people at its core.

Energy communities are the perfect embodiment of smart, sustainable, and inclusive growth. The innovative component should be understood holistically. As highlighted in EU legislation, CECs, and RECs are first and foremost referring to an organizational concept. It is, therefore, natural to look for innovation linked to this unique characteristic. What sets community-led projects apart is the socially innovative components of shared governance and ownership for those deployments. Through the ownership of the solar projects, social acceptance of renewables is maintained, while also the educational role that energy communities play for their members contributes to behavioural change towards energy use and renewables.

Best practices: social and technical innovation

This section includes examples of solar deployment by community energy initiatives depicting technical innovation, while also highlighting the social innovation elements that energy communities bring forward.

Community- led agri-PV

Energy communities can contribute to strengthening the agri-food sector and empowering local rural communities by combining technological and social innovation through practical applications in a new paradigm of land use.

In Ioannina, the first urban community agri-photovoltaic project in Greece is already being planned and a replication will follow in Skopje, North Macedonia. It is an urban vegetable

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[5] Directive (EU) 2019/944 on common rules for the internal market for electricity OJ L158/125, 14.6.2019, (Electricity Directive), Recital 46.
[6] Recast Renewable Energy Directive, Recital 71.
[7] Id.

garden that will be combined with the production of clean energy from special photovoltaic panels. The pilot will be coordinated by the local energy community **CommonEn**[8] and the design will follow participatory procedures with the involvement of citizens and local stakeholders. The project is primarily funded by the German Federal Foundation for Environment (DBU) and co-funded by the Onassis Foundation. In parallel, the project is supported by the Municipality of Ioannina and the Solar Hub project.

The Solar Hub project is a Greek-Turkish Excellence Hub that aims to promote solar energy technologies, with a focus on agri-voltaic and solar thermal systems and their applications in the agri-food sector. The Greek ecosystem, coordinated by the Centre for Research & Technology Hellas (CERTH), promotes networking, solution development, training, and knowledge transfer activities.

Barriers identified through the development of the project include:

- The lack of a clear regulatory framework that sets out the remuneration mechanisms for the produced energy, as well as the exact technical considerations that constitute a 'community-led' (e.g., number of members from the local community), 'agri-PV' (e.g., types of vegetables that can be grown).
- The lack of a clear enabling framework, including priority grid access for such projects, as well as their inclusion as a separate technological category in public funding tenders.
- Easing procurement/land leasing by municipalities to local communities to install citizen-led agri-PV projects within the confines of the city. Currently, various land zoning restrictions make the procedure too cumbersome.
- Inclusion of clear reporting benchmarks of the progress Member States are making in allowing energy communities to undertake innovative solar projects, like agri-PV (or other forms, like floating PV), in their National Energy and Climate Plans (NECPs).

Despite the lack of legislative framework in Albania, a group of citizens developed **Piskova Solar Farming**[9] to inspire fellow citizens and showcase the potential of energy communities. Piskova Solar Farming comprises a 3kWp photovoltaic (PV) plant that powers the water pump of Piskova, a village of about 2,000 inhabitants in southern Albania. While the installation covers only 10% of the pump's electricity needs, it offers local farmers a discount on the high energy bills they incur for irrigating their land. The project was supported by Milieukontakt Albania in the context of the EUCENA project (funded by EUKI). A crowdfunding campaign was organised and about a year later the installation was completed, and the 3kWp solar farm began supplying electricity to the water pump. In the

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[8] More information on CommonEn can be found here: https://www.commonen.gr/en/
[9] https://www.rescoop.eu/news-and-events/stories/september-success-story-a-small-solar-power-plant-inspires-change-in-albania

future, the local farmers are expected to organising themselves and mobilise more capital to expand the plant's capacity.

Elektropionir[10] has developed the first cooperative energy projects in Serbia. Solarna Stara, comprises of two solar projects each with a production capacity of 5kW. These installations are located on the roofs of local community buildings in the villages of Temska and Dojkinci, on Stara Planina mountain in southeastern Serbia. The installations are about to get connected to the grid. The project was partly funded through a crowdfunding campaign, and the revenues from selling the electricity to the grid will be channelled into local community projects eligible for funding.

Technical innovation: agri-voltaic park
After these first projects, Elektropionir continued with an agrovoltaic power plant – the first one in the country – located in an organic farm in Gornja Bukovica, central Serbia. This installation comprises of 48 solar panels with a total capacity of 17.5 kWp. Once operational, the revenues from selling the electricity will contribute to the cooperative's operational cash flow.

Social innovation: gender justice
Elektropionir takes an inclusive approach when developing projects, involving citizens, regardless of gender, age and origin. Although they don't have a formal gender plan, they have started out with a female director and a female chair of the General Assembly. The initiative has received an award from Belgrade feminist cultural centre BeFem on 8 March in 2023 for widening participation in the Solarna Stara project to women and people from different generations and backgrounds. One of the leading cooperative figures, Ana Džokić, was also recognised as Female Leader in Sustainable Energy by WISE Serbia women's network.

Socio-technical innovation: a solar park supporting biodiversity
The Dutch environmental organisation '**Natuur en Milieufederatie'** has been convinced that renewable energy facilities can go in hand with enjoying nature and enriching the landscape. This has taken shape in the concept of energy gardens. An energy garden is an area accessible to everyone where renewable energy is produced sustainably, nature flourishes and citizens can spend free time or enjoy the landscape. The space is designed as a whole, creating synergies between its different elements. For example, a solar park can be used to organise educational visits, fauna and flora are selected according to the conditions created by the energy installations, or cycle paths cross the woods for the enjoyment of citizens. This challenges the traditional way of thinking: it goes from how can I produce as much energy as possible to how can my project create the most possible societal impact.

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[10] https://www.rescoop.eu/news-and-events/stories/march-success-story-pioneering-community-energy-in-serbia-with-an-inclusive-approach

In Noordmanshoek[11], the local energy cooperative called '**Goed Veur Mekare'** built and manages a 7.5 Gwh solar park. The installation covers an area of 6.5 hectares and is designed to pay special attention to landscape integration and biodiversity. The solar panels cover 54% of the surface, which is exceptionally low, to leave space for nature and indigenous species, and natural hedges and thickets have also been planted along the edges of the installation.

Community-led Building-integrated PV

Socio-technical innovation: innovative financing schemes for solar energy & energy efficiency advice for households

Gent Zonnestad,[12] a project put forward by the local energy cooperative EnerGent (Belgium), is resolutely promoting more solar panels in Ghent (Belgium) and its surrounding area. The cooperative offers independent advice to home owners, tenants and local businesses and successfully developed a map indication how well buildings in the city are oriented for solar energy production. According to the principle of a group purchase, socio-environmentally responsible panels are purchased at competitive, predetermined prices.[13]

Alcolea del Rio[14] is one of the first community-owned solar PV project in Spain. The project is close to Sevilla and one of the first projects put forward by Generation kWh, an innovative financing scheme developed by Som Energia. The members of the cooperative provide zero-interest loans and in return they get access to clean energy at cost price. Despite the lack of subsidies or feed-in premiums for RES generation in Spain, the cooperative decided to proceed because of the project's environmental and societal value. The project has been operational since 2016 and generates electricity to cover the needs of about 1.300 families.[15]

Socio-technical innovation: roof-top solar and energy efficiency for schools

Through **Klimaatscholen 2050**,[16] a consortium of five REScoops from Flanders (Belgium) were assigned to help catholic secondary schools to save significant amounts of energy in their school buildings by initiating energy efficiency measures and by putting solar PV-panels on the roofs. The funds that are needed to make these investments are raised from local citizens. The cooperatives will be responsible for the project exploitation, so that the participating schools get a reduction on their energy bills.

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[11] https://www.rescoop.eu/news-and-events/stories/february-success-story-harvesting-energy-hand-in-hand-with-nature-and-citizens
[12] http://zonnestad.energent.be/
[13] More information can be found in Deliverable 4.1.'Best Practice Guide' of the COMPILE project.
[14] https://www.generationkwh.org/los-proyectos/alcolea-del-rio/
[15] More information can be found in Deliverable 4.1.'Best Practice Guide' of the COMPILE project.
[16] https://www.klimaatscholen2050.be/

Energy4All from the United Kingdom supported the start-up of **Edinburgh Community Solar Cooperative**,[17] a local cooperative that successfully raised 2 million euros to install 25 solar PV arrays on public buildings in Edinburgh (Scotland). Residents who join the co-operative and purchase a share also get a fixed return on their capital. In addition, Energy4All has been helping schools and communities in the UK start community renewable energy projects. After the success of the Wey Valley Solar Schools Energy Cooperative[18] in 2011, schools across the country contacted Energy4All to join the financial model the cooperative had set up. Due to changing feed-in-tariffs in England in 2013, Energy4All adapted the Wey Valley model and founded the Schools' Energy Cooperative in order to support more English schools in creating renewable and energy efficiency projects. Profits and energy savings are paid back to the schools, reducing their monthly bills. The Schools' Energy Cooperative now owns and operates 1,76MW of solar PV on 44 schools. Overall, Energy4All helped the Schools' Energy Cooperative raise EUR 2 million, and continues to support the schools with monitoring of the systems and administrative tasks.[19]

Socio-technical innovation: roof-top solar for energy justice
Brixton energy cooperative is a cooperative made up of tenants of social housing projects in the Brixton borough of London. The 52 kWp roof-top solar panels are partly owned by the residents via the Brixton Energy Solar 3 cooperative.[20] The setting up of this initiative led to more demand and community interest in similar schemes, which ultimately led to the establishment of Repowering London. Repowering now helps communities to fund, install and manage their own clean, local energy, based on early examples such as the cooperative in Roupell Park Estate. A big success, of course, is the community involvement and empowerment that was central to its development. Residents were strongly involved in developing the installation and cooperative. Over time, they have benefited from training and work experience opportunities focusing on solar energy, legal and governance structures, community engagement, marketing, information technology and other areas. In terms of financial benefits, residents have experienced significant savings on their energy bills individually and have been able to ringfence some of the revenues from the cooperative into a dedicated community fund. In turn, the fund organises additional local projects, events, training and programmes.

Socio-technical innovation: an energy community for urban transformation
In Telheiras, part of the Lisbon civil parish of Lumiar (Portugal), with profound socio-economic inequalities, a **REC Telheiras**[21] is being built by the local citizens, with the support of the local government. Its buildings date from the 80s-90s, suffering from poor construction and thermal discomfort. However, they still use 50% less energy than

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[17] https://www.edinburghsolar.coop/
[18] https://www.weyvalleysolar.co.uk/
[19] More information can be found in Deliverable 4.1.'Best Practice Guide' of the COMPILE project.
[20] More information is available at: https://brixtonenergy.co.uk/projects/brixton-energy-solar-3/
[21] Mello, J. et al., IEEE Power & Energy Magazine. Decarbonized and inclusive energy: a two-fold strategy for Renewable Energy Communities

theoretically required to achieve thermal comfort for both winter and summer. REC Telheiras pilot project is being promoted by Viver Telheiras and the Lumiar Civil Parish, with the support of Coopérnico and CENSE FCT-NOVA in the scope of the EU's Energy Poverty Advisory Hub first call for technical assistance.

"Viver Telheiras", is a local association that coordinates the Local Partnership of Telheiras, a community network with 24 members created in 2013, bringing together local authorities (Lumiar Parish), institutions (social support), associations (parents, cultural, retired, disabled, residents), organizations (scouts, religious groups), local commerce, and informal groups, to share resources and organize events. The association seeks to contribute to the urban transformation of the Telheiras neighborhood in aspects such as culture, education, active citizenship, social support, and environment. This laid the groundwork for addressing climate change fight and energy poverty. With the collaboration of a very interventive local civil parish, there was a shared vision and mission. This facilitated the creation of the community. The citizens creating REC Telheiras are developing an inclusive and sustainable REC model, promoting energy democracy and strengthening the sense of belonging to Telheiras's neighborhood.

Socio-technical innovation: roof-top solar on mining legacy for sustainable energy future

The municipality of Loos-en-Gohelle searched for innovative ways to use its mining legacy in its wish to achieve energy autonomy by 2050. Mine du Soleil[22] operates 2,380m^2 of photovoltaic panels, generating a collective installed power of 448 kW across eight municipal rooftops, including sports halls, multifunctional centres, and schools. This production is equivalent to the annual consumption of 175 households. The initiative comprises of 126 citizens of Loos-en-Gohelle; the municipality; SEM Energies Hauts-de-France, a regional public agency that supports the development of renewable energy projects; and SUNELIS, a local PV installer.

The local government further incentivises citizen participation by gifting a €50 share of Mine du Soleil to every newborn in Loos-en-Gohelle – subject to parents' approval. Efforts are also underway to develop an energy solidarity fund aimed at providing energy kits to citizens in vulnerable situations. These kits would help educate families on energy saving practices and provide ready-to-install or second-hand solar panels for installation in their homes.

Community-led Building-integrated PV & Vehicle-integrated PV

The energy cooperative Zuidtrant[23] based in Antwerp (Belgium) installs solar roofs in schools, sports halls and municipal buildings in the immediate vicinity of residential areas that will provide not only for the building, as well as for shared electric cars, which save

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[22] https://www.rescoop.eu/news-and-events/stories/february-success-story-joining-forces-for-a-just-energy-transition

[23] https://www.zuidtrant.be/deeldezon

and generate energy through the use of smart, bi-directional charging points when the demand for electricity is high in a sustainable and flexible way.

Specific projects under this scheme:

- Boechout: School: 15,67 KWp PV, 1 car for e-carsharing, 1 charging station (V2G);
- Bonheiden: Communal building: 76,9 KWp PV, 2 cars for e-carsharing, 2 charging stations (V2G);
- Mortsel: Music Academy: 19,8 KWp PV, 1 charging station (V2G);
- Lint: elderly house: 40,6 KWp PV, 1 charging station (V2G);
- Wijnegem: library & cultural centre: 30,15 KWp, 2 cars for e-carsharing, 2 charging stations (V2G);
- Hemiksem: sharing depot: 54,34 KWp PV, charging station (V2G);
- Mortsel: recycling shop: 350,1 KWp, 2 cars for e-carsharing, 2 charging stations (V2G).

Technical innovation: rooftop solar & e-car sharing
Solar panels are installed on a high-capacity roof in the district, such as a town hall or sports hall. They supply solar energy to the local grid and electric cars. Neighborhood residents can reserve the car via an app (e-car sharing), which continuously monitors how much the battery is currently charged. An energy management system continuously monitors the status of the battery and ensures it never falls below 30 per cent. Smart charging stations charge the car when there is plenty of solar energy available (smart charging) and feed the solar energy from the battery back to the building or the local district network when there is high demand for electricity. In this way, the battery of the electric car acts as a battery for the neighbourhood, which helps prevent the local grid from being overloaded in case of high electricity demand.

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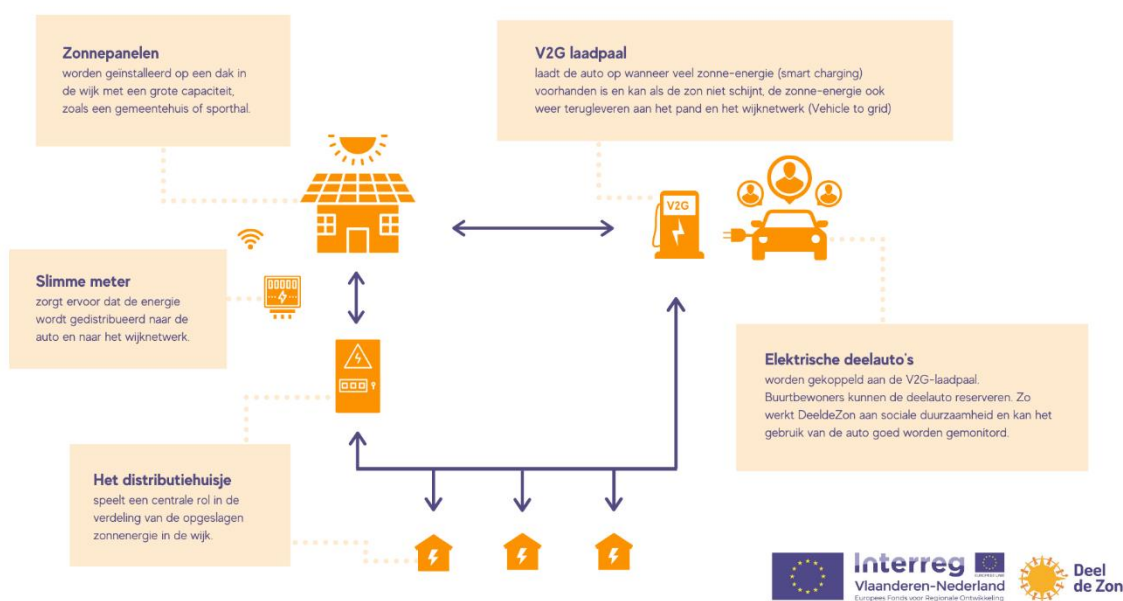
Social innovation: city-citizen collaboration
The local cooperative owns and manages the solar PV installations on the public roofs (partnership with municipality). There is a contract between the cooperative and the user of the public building (self-consumption). The additional produced electricity is used for neighbourhood shared mobility. The project explicitly encourages neighbours to use shared mobility (cars and bikes charged with locally produced energy).

How the community energy solar innovation can be promoted

In its guidance document on innovative forms of solar energy deployment, the Commission should ensure that social innovation has its place and the unique characteristics and social benefits that energy communities bring forward are adequately reflected. More specifically, the Commission should urge Member States to:

- Ensure full and effective transposition, implementation, and enforcement of EU rules to create robust regulatory and enabling frameworks that level the playing field for energy communities in the energy market and address the barriers they are currently facing. Such enabling frameworks should adequately take into account the specific characteristics of energy communities and the unique social and innovative elements they bring forward.
- Foresee in their National Energy and Climate Plans (NECPs) support measures for innovative projects developed specifically by energy communities. Promoting social and technological innovation can provide incentives, especially for young people, to return (or remain) in rural areas, thus also contributing to reversing population desertification. Solutions and policies in the context of a holistic planning for rural development should be co-designed by farmers and local communities in the countryside themselves, and should be co-owned by them – as can be done through energy communities.
- Set at the national level and in their NECPs specific energy community targets, in line with the requirement of the EU Solar Energy Strategy, aiming at developing at least one renewables-based energy community in every municipality with a population higher than 10.000 by 2025.
- Ensure that energy communities are supported through available EU funds and the application of State aid rules, and national funding programmes are developed to help derisk community projects.
- Encourage inclusiveness in energy communities by lowering barriers to entering such initiatives and by supporting them to take a stronger role in achieving social objectives and becoming more inclusive towards vulnerable and energy poor households.
- Ensure that energy communities can pass on the benefits of local renewables production to their members, particularly through lower energy bills, by guaranteeing access to grids for energy sharing, the ability to supply, and to enter into Power Purchase Agreements.

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- Promote collaboration between municipalities and energy communities by providing more funding and technical support to local authorities, and by clarifying rules around public procurement and concessions to support participation of energy communities in public tenders and concessions allocation.