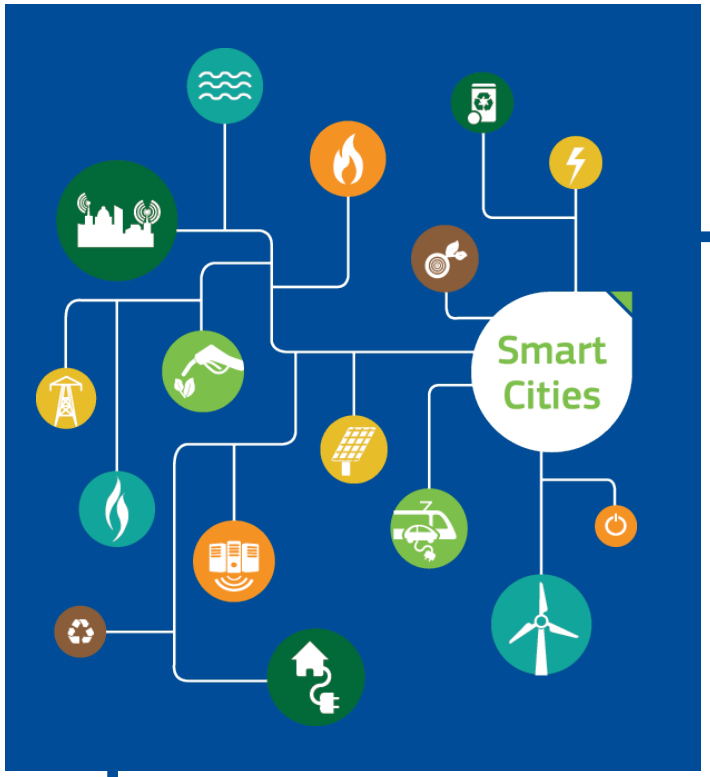
European Commission

EU Smart Cities Information System

ENERGY COMMUNITIES
SOLUTION BOOKLET

EU Smart Cities Information System



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WHAT IS AN ENERGY COMMUNITY?

An energy community (EC) is a way to organise **collective energy actions** around open democratic participation and governance and to provide benefits to its members or the local community. Benefits can be **social, environmental or economic**, though the latter should not be the driver. Participation is open to a wide group of stakeholders, citizens, local governments, public entities and companies, but decision making can be limited to avoid that large entities active in the sector monopolize the initiative.

WHAT IS THE SMART CITIES INFORMATION SYSTEM?

The Smart Cities Information System (SCIS) brings together project developers, cities, institutions, industry and experts from across Europe to exchange data, experience, know-how and to collaborate on the creation of smart cities and an energy-efficient urban environment.

WHAT IS A SOLUTION BOOKLET?

A summary of the management framework, primarily written for cities. It seeks to reduce the effort, speed up the process, strengthen quality and confidence in outputs, align across disciplines, and generally prepare a city to engage the market to acquire a solution.

WHAT & WHY

WHAT AND WHY?

Energy communities (ECs) are a new cooperation concept in the energy market, introduced by the Clean Energy Package.

It is widely discussed, but often not well-understood. This booklet explains the background and the positioning. It aims to clarify what energy communities are and what they are not. Before diving into the details, another concept briefly needs to be explained:

Collective self-consumption: the principle of sharing renewable energy, generated at the building-level, between the users of the building. A well-known example is an apartment building or a commercial complex with multiple tenants.

Collective self-consumption does not require the set-up of an energy community, it is a simple format that all European Union (EU) Member States should adopt. The main difference between collective self-consumption and energy communities is in the aspect of a single building vs. multiple buildings. This booklet specifically focuses on energy communities.

Eco-life project in Kortrijk, Belgium

Background and context

Under the driving force of market liberalisation, favourable renewable energy policy frameworks and the innovation in distributed energy technology, the energy market is gradually **transforming from a top-down centralised system to a more low-carbon, smart and combined centralised-decentralised system**. Figure on the right side shows the shift.

Changes are happening throughout the entire system, with **more intermittent renewable energy production** at all levels and the **integration of flexibility through storage, power-to-gas and more dynamic and responsive energy consumption behaviour** at the level of energy consumption.

The decentralisation of technology allows **for new actors** to enter the market: **it allows consumers to become 'active' by taking control over energy-related activities, either individually or collectively in the form of energy communities.**

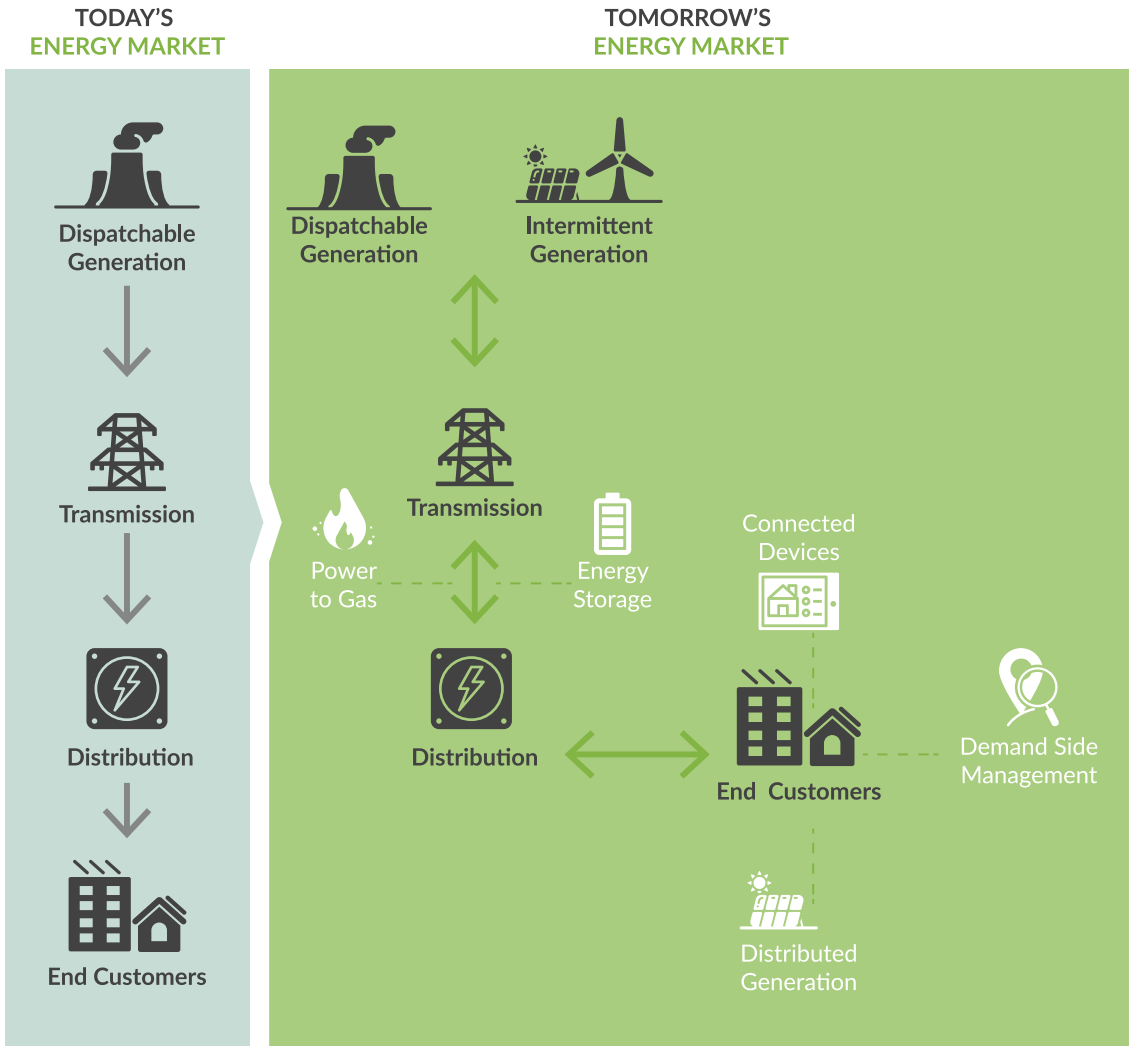
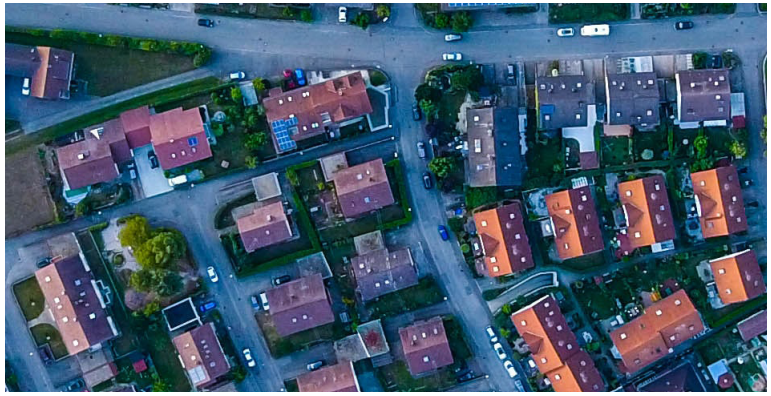


Figure illustrating how the energy market is gradually transforming from a top-down centralised system to a more low-carbon, smart and combined centralised-decentralised system.

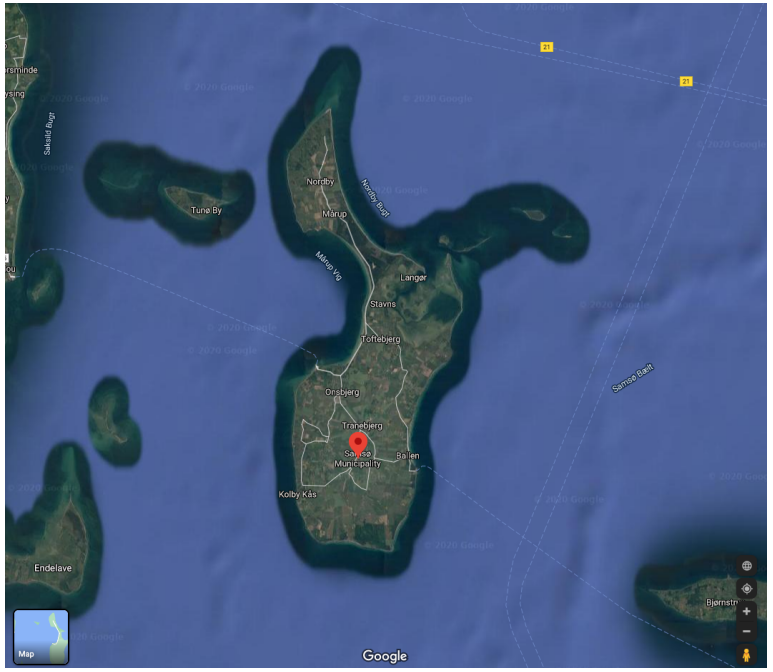
Energy communities are not a totally new phenomenon: in several member states they were already allowed in one way or another. In **Germany, Sweden, Belgium, the Netherlands and Denmark**, these types of initiatives are well-represented and have a history that dates back to the 1970s and 80s[1].

In **Germany**, these initiatives primarily take the form of solar cooperatives (so called **Energiegenossenschaften**) and municipal utilities (local distribution companies which are (partly) owned by municipalities). In 2012, it was estimated that individual citizens and communities installed 34% of the total installed capacity of renewable energy in Germany, with nearly 50% of the total installed PV capacity and 25% of the total installed onshore wind energy capacity[2].



1 Bauwens, T., Gotchev, B. and Holstenkamp, L., 'What drives the development of community energy in Europe? The case of wind power cooperatives', Energy Research & Social Science, Volume 13, March 2016, pp. 136-147;
2 See in this regard Amecke, H., 'German Landscape of Climate Finance, Climate Policy Initiative' (2012) Climate Policy Initiative 2016, pp. 1-23.

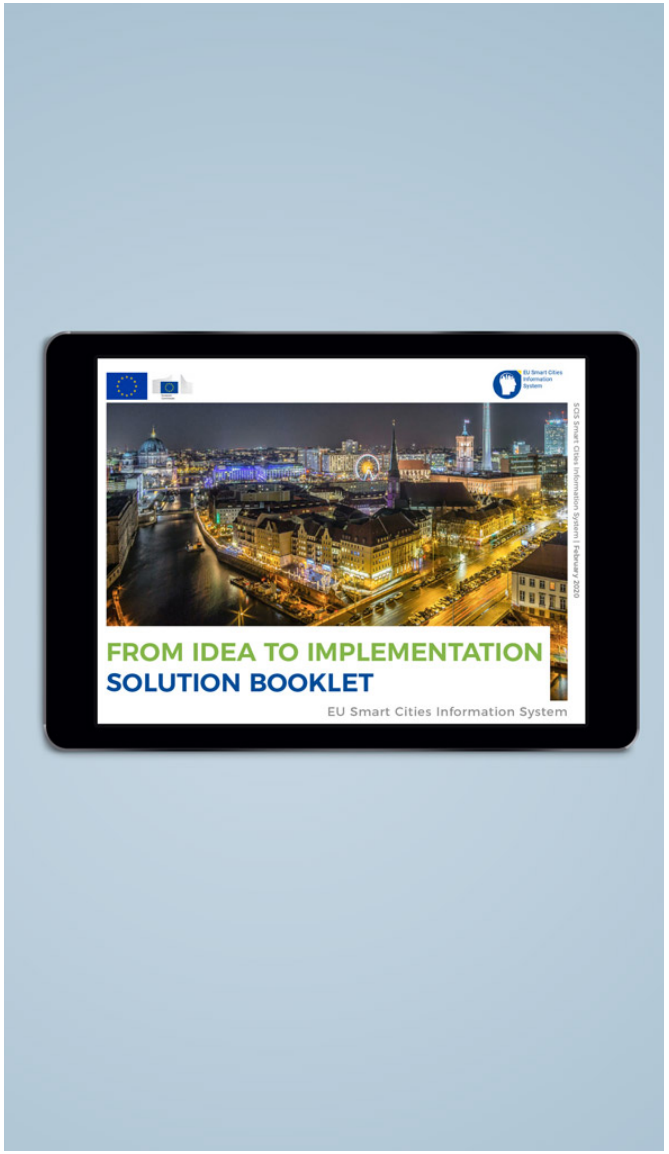
In **Denmark**, wind cooperatives or **guilds** are most common[3]. In addition, there are also entire island communities, such as **Samsø**[4] that aspire to be energy-independent through (partial) community ownership. In other member states, energy communities are either absent or they only represent a small segment of the market[5].



3 Recent study shows that there are approximately 100 wind cooperatives. See in this regard, Marieke Oteman, Mark Wiering and Jan-Kees Helderman, 'the institutional space of community initiatives for renewable energy: a comparative study of the Netherlands, Germany and Denmark' [2014] Energy, sustainability and society, p. 11.
4 See in this regard, Peter Jacob Jorgensen, Samso a renewable energy island 10 years of development and evaluation (Chronografisk 2007).
5 Recently, a renewed interest in energy cooperatives has emerged in the UK, Sweden, the Netherlands and Belgium. See in this regard ibid 4 and Séverine Saintier, 'community energy companies in the UK: A Potential Model for Sustainable Development in "Local" Energy' [2017] Sustainability MDPI.

Despite this steep rise in energy communities, they are often confronted with a range of institutional barriers due to a regulated energy market that is customized to the traditional market outlook of large vertically integrated companies that have affluent financial and technical resources.

This reality has resulted in a series of institutional barriers[6], specifically linked to the characteristics of energy communities, which prevent them from entering and/or competing on the EU energy markets on equal footing with traditional energy companies.[7]



Read more about the major barriers to the implementation and replication of a smart energy project here.

Barriers in a smart energy project:

- Social
- Technical
- Organisational
- Financial
- Regulatory
- Legal
- Political

OrganiCity is a service for experimentation, which explores how citizens, businesses and city authorities can work together to create digital solutions to urban challenges.

6 Examples of 'institutional' barriers are unfavorable legislation, support mechanisms, administrative barriers, grid access, high investment costs, and the existence of oligopolies (due to large economies of scale). See in this regard, Benjamin Huybrechts and Sybille Mertens, 'The relevance of the cooperative model in the field of renewable energy [2014] Public and Cooperative Economics, pp. 199-201. See also Binod Koirala, Elta Koliou, Friege J, Rudi Hakvoort, Paulien Herder, 'energetic communities for community energy: A review of key issues and trends shaping integrated community energy systems' [2016] Renewable & Sustainable Energy Reviews. This Article further differentiates between identified hard and soft institutions. In this regard, hard institutions refer inter alia to legislations, capital markets, whereas soft institutions consider cultural and social norms. Other barriers are socio-economic, technological and environmental. For a comprehensive oversight of potential social barriers see Eimaer Heaslip, Gabriel J. Costello, John Lohan, 'Assessing good-practice frameworks for the development of sustainable energy communities in Europe: lessons from Denmark and Ireland, p. 308.

7 Vertically integrated large energy companies.

VISUAL SUMMARY OF SMART ENERGY BARRIERS MADE BY TH!NK E FOR CITY-ZEN PROJECT IN 2019:

SMART ENERGY SOLUTIONS: WHAT IS KEEPING CITIES FROM IMPLEMENTING?

BARRIERS and SOLUTIONS

EXPLORATION PHASE

"People need to have the time to go to seminars and information is scattered"

"Suspicion of partiality when too much contact with one company"

TIME-CONSUMING

"One-on-one in-depth conversation combined with a field visit early on in the process"

PEER-TO-PEER DISCUSSION

STRONG LOCAL NETWORK

FIELD VISIT TO A SIMILAR IMPLEMENTATION

BRINGING CITIES TOGETHER

TENDERING PROCESS

"You already need to know now which techniques to implement in 5 years"

"Defining a number of criteria / goals, but not the road to get there."

TOO RIGID

EMBEDDING FREEDOM

TIME-CONSUMING

ECONOMY OF SCALE

FRAMEWORK CONTRACT

TWO-STEP APPROACH

"City can hire externals for a certain period of time"

IMPLEMENTATION PHASE

TECHNICAL

"An installation in somebody's home needs to function"

SHARING NOT ONLY SUCCESSES BUT ALSO FAILURES

OPPORTUNITY TO BUILD ON THE ACCUMULATED KNOWLEDGE

UTILITIES

"The grid is not ready for the load of tomorrow"

LAB VS REAL LIFE SITUATIONS

RELIANCE AND DURABILITY

SOCIAL

Cultural reasons

INHABITANTS

Not interested, other problems

Suffer from road works

PROFESSIONALS

Schooling for technology of the past

New technology too complicated

Not up-to-date with new products

"Technical people forget people need time to get used to new techniques"

"Listen to citizens and act upon the feedback"

COMMUNI-CATION

"Dare to ask commitment from the citizens"

FINANCIAL

NO BUSINESS CASE SMART CITY SOLUTIONS = DRIVING COSTS

ROI PERIOD

"Invest in people who are specialized in applying for subsidies and financing schemes."

ADMINI-STRATION

SUBSIDIES AND FINANCING SCHEMES

PRIVATE FINANCIAL INVESTORS

FINANCING AFTER PILOT

HORIZONTAL FINANCING

SCALING UP

LCA APPROACH

LEGAL / POLITICAL

"You don't know which rules you will have to follow in the future."

REGULATORY FRAMEWORK INSECURITY

CITY CLASHES WITH THE LIMITS OF ITS POWERS

"Budgets are decided upon with every new mayor. But innovation doesn't come in waves per 6 years."

NEEDED: STRONG POLITICAL LEADERSHIP AND VISION

STRUCTURAL COLLABORATION BETWEEN CITIES

GDPR

CANCEL

LONG-TERM PLANNING

EXEMPLARY TECHNOLOGIES

"Collaboration with external parties for long-term thinking and systems thinking"

"A repository of well-tested and trusted smart energy solutions."

ORGANISATIONAL

"Municipality focuses on everyday needs because of staff shortage"

STAFF SHORTAGE

HORIZONTAL COLLABORATION WITHIN THE MUNICIPALITY

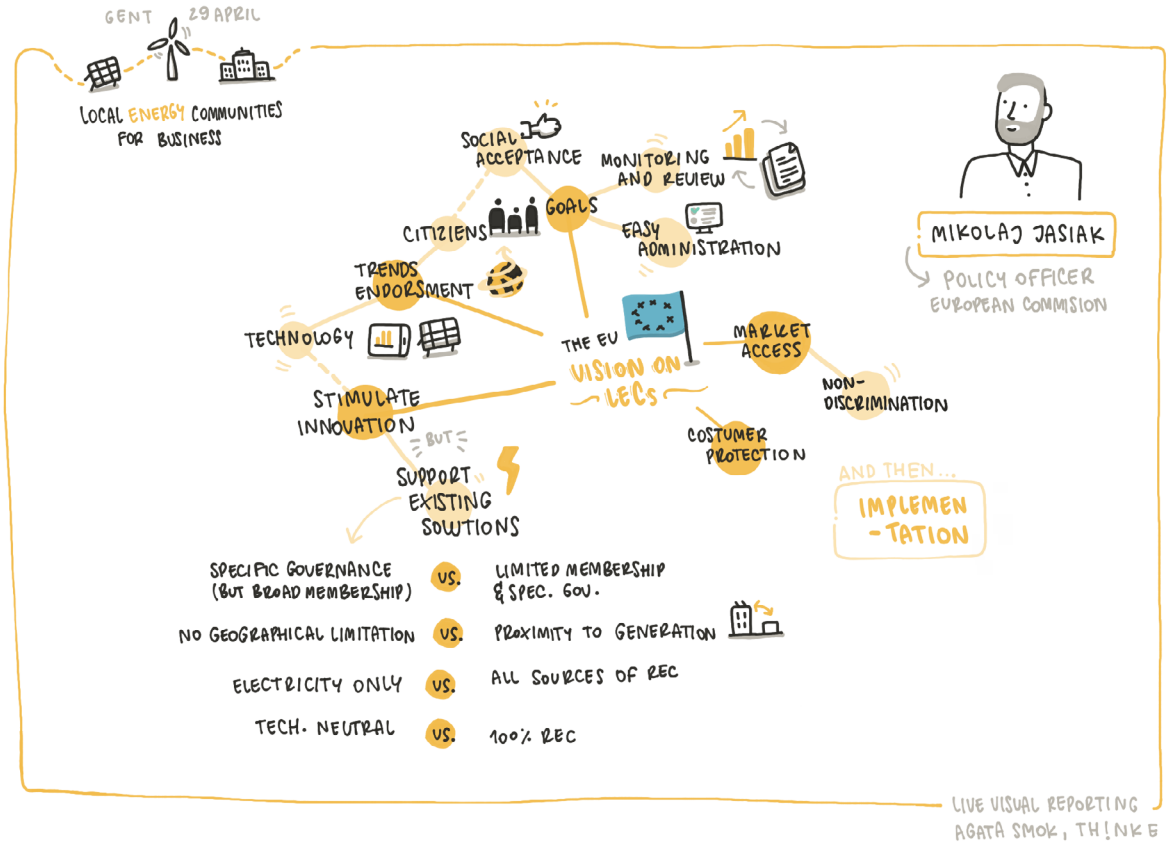
"Scale advantage compared with many small individual cities"

METROPOLITAN STRUCTURE

EXTRA PROJECTS TAKE TIME

LITTLE SPACE (COMMUNAL OR IN PEOPLE'S HOMES)

The EU has recently recognised the need for **adjusted market regulation** in order to level the playing field for energy communities by introducing a legal framework for 'citizen energy communities' (CEC) in the revised internal electricity market directive (EMD) and 'renewable energy communities' (REC) in the revised renewable energy directive (RED II) in the Clean Energy Package for All Europeans (Clean Energy Package). The EU hopes that these energy communities will help mobilise private capital, enhance the flexibility in the market and lower public resistance against the energy transition[8].



Important to note is that the **European directives do not entail a reduced tariff for energy communities compared to other actors.** The directives clearly emphasize the level-playing-field.

Energy communities are to deliver **social, environmental and economic benefits** to their members, with **participation being open and inclusive**. Not all above mentioned examples have been successful in this.

8 Vision expressed by Mikolaj Jasiak (DG ENER) in a presentation on 29/4 in Ghent.

Samsø: Lessons to be learned

The island started its energy transition after winning a competition sponsored by the Danish Ministry of Environment and Energy. The challenge for the competing islands was to present a convincing plan for converting all of their energy systems to renewables within a period of 10 years. Samsø won the competition.

A **substantial amount of subsidies was in place**, e.g. for wind-turbines, for home owners to renovate their houses and subsidies for converting heating systems to more sustainable ones. Several district heating corporations were set-up and co-investments in wind-turbines were presented. While several islanders did participate, those with lesser financial means did not. The transition has provided new economic activities to the island, for example, energy tourism is now an important additional source of revenues. However, those that could not participate at the moment investments were decided, feel left out and feel like they contributed to an increasing wealth of the ones that were able to co-invest.

The transition is impressive but the engagement process was not ideal: the model was set up under conditions with impressive support measures. However, the replacement of old wind-turbines requires an investment in new ones, now under less-favourable conditions. This poses a challenge.

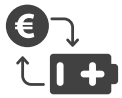
What's in a name?

Energy communities are a legal entity which is controlled by a community of formerly known passive consumers, in which participation is open and voluntary. In the most ideal scenario, an energy community brings public, social and economic actors together in order to take control over energy production and supply.

Energy communities consist of a **social, environmental and economic dimension**. The social dimension relates to the element of collaboration and organisation between the members of the energy community, as well as the principles that guide such a cooperation.

The **environmental aspect** refers to the expected increase in renewable energy and sustainable initiatives reducing air pollution, such as the **sharing of electric vehicles**.

The **economic dimension** relates to the variety of activities energy communities might exercise, such as **demand-response services, distributed storage, renewable energy generation, electro-mobility, energy-efficiency services, ...** as well as the **integrated use of distributed technology** (storage, electrical vehicles, production facilities, smart meters, blockchain technology) in order to efficiently match consumption and production at community level.



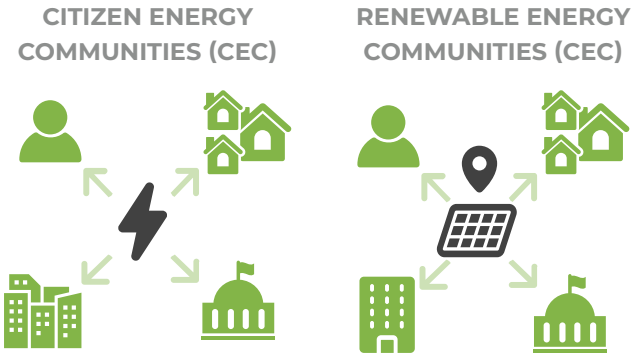
Municipality of Megara - Greece

The municipality of Megara is looking to establish an energy community in order to tackle the rising problem of energy poverty within the city. The municipality of Megara is collaborating with the University of West-Attica to map their constituents that can be qualified as energy vulnerable or poor and aims to invest in energy-efficient and renewable appliances, such as solar thermal systems and rooftop PVs.

(Source: case-study – first-hand information)

Attention should be paid to the fact that the above mentioned economic activities are not exclusive to energy communities. Other actors are also entitled to provide demand-response, own and operate storage, exploit electric vehicle fleets, etc.

Aggregators and providers of energy flexibility services are therefore expected to become increasingly relevant. They can deliver services to the energy community or to individual asset owners.



Energy Communities (ECs) are an overall concept. The EU regulatory frameworks provide two definitions embodying the same principle, yet with slight differences: **Renewable Energy Communities** (RECs –under the Renewable Energy Directive) and **Citizen Energy Communities** (CECs – under the Electricity Directive).

The difference between REC and CEC is depicted in the below table:

	Citizen Energy Communities (CEC)	Renewable Energy Communities (REC)
Membership	Open to all types of entities.	Natural persons, small and medium sized enterprises (SMEs), local authorities, incl. municipalities.
Governance	Effectively controlled by shareholders or members of the project; Limitation for shareholders engaged in large scale commercial activity and for which energy constitutes primary area of activity are excluded from control.	Effectively controlled by shareholders or members that are located in the proximity of the RE project;
Geographic limitation	No geographic limitation.	Shareholders or members must be located in the proximity of the renewable energy project that they are investing in, although member states can themselves define the scope of proximity.
Type of energy	All types of energy generation.	Only renewable energy.
Purpose	Provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits.	Provide environmental, economic or social community benefits for its shareholders/ members or the local areas where it operates rather than financial profits.

Energy communities, whether CECs or RECs, are interesting concepts to increase active **end-consumer participation in the energy market**. However, they are a means to achieve a goal and not a goal as such. Energy communities are a way to enable this activation, to increase the **investment in renewable energy and to ensure the energy transition is open to all and inclusive**.

While several pilot projects have been launched using a lowered tariff for in-community exchange and business models were developed using this lowered cost, **economic profit is not the aim.**

Furthermore, the potential reduction in tariffs is not always so obvious as to be justified.

Read more about citizen engagement here.

CITY CONTEXT

Picture from 2019 © Leuven2030 when 16 key actors signed Leuven 2050 City Roadmap.

CITY CONTEXT

Different European cities have a form of energy communities already in place since long before the establishment of the concept in the European directives. They were often seen as part of a drive towards more sustainable energy provision, local energy generation and hence local job creation as well as a way to deliver energy at lower cost to the residents and hence to contribute to alleviating energy poverty.

Not all of the existing initiatives are aligned with the new definitions, though there is no reason they should not be able to continue their operation if they constitute a fair model towards both participants and non-participants. Important is, furthermore, that a distinction is made with experiments in regulatory sandboxes. The latter are not always scalable and replicable and too often have been based on exemption from (parts of) the electricity tariff.

Ebem Energiebedrijf - Belgium, Flanders

Ebem Energiebedrijf is an energy production and supply company that was set up at the beginning of 2002. The initiative is in full ownership of the municipality of Merksplas. For power supply, Ebem relies on decentralised production units, and for gas supply, they rely on a biomass installation that converts GFT waste from 500,000 Kempner residents into energy.

(Source: ebem.be).

De Ceuvel - the Netherlands

De Ceuvel is an award-winning, sustainable planned workplace for creative and social enterprises on a former shipyard in Amsterdam North. In 2012, the land was secured for a 10-year lease from the Municipality of Amsterdam after a group of architects won a tender to turn the site into a regenerative urban area. Boats where used to avoid digging into the polluted soil.

Although they express their ambition to be as self-sufficient as possible, only a minor share of their on-site used electricity is actually produced at the moment of consumption. For the rest, the complex is connected to the grid with one single connection point. Electricity is shared between the different users using a local currency, i.e. the Jouliette. Such models are interesting to test technological innovations and exchange platforms, though they are based on avoidance of societal contributions that are collected through the electricity tariff.

(Source: deceuvel.nl).

It is important to note that none of these initiatives have been set-up **to deliberately avoid contributions to societal costs**. It has mainly been a **lack of clear communication and the provision of a system-level perspective**.

Electricity tariffs include a large number of costs related to the **infrastructure that is in place and its maintenance, taxes and levies including the cost of subsidies for wind-turbines, green energy certificates to PV installations** to even, in some Member States, the **cost of maintenance of public lighting**. The decision to build a model where such contributions are reduced or avoided has implications for non-participants: they now have to pay for the electricity infrastructure costs for the overall system, while the operation of the energy community has most probably not impacted the cost.

The confusion on potential financial models that might conflict with **principles of fairness**, is often due to a lack of clear communication and the **failure to provide a system-level perspective** in the explanation of the benefit of energy communities.

Building models solely on cost avoidance of societal benefits can therefore include increased **risks for energy poverty**.

Leuven 2030, Belgium

Leuven 2030 is a non-for-profit organisation initiated by the **city of Leuven in Belgium** to facilitate the energy transition of the city, its citizens and the companies and organisations within the city. Several actions are set up with local actors, an ELENA project was launched and co-investments in renewable energy on public buildings have been set-up.

The organisation has put Leuven on the map at a European scale, but has additionally enabled restaurants, citizens, schools, shops and large companies to cooperate and share expertise, support each other and be part of the energy transition.

Source: leuven2030.be

Picture from 2019 © Leuven2030 when 16 key actors signed Leuven 2050 City Roadmap.

Several cities have been looking into the concepts of energy communities, often as part of a conceptual model for Positive Energy Districts (PEDs). The concept of energy communities enables cities and municipalities to develop and support initiatives with and for citizens and companies to invest in local renewable energy generation. PEDs are therefore potential formats to implement energy communities.

The examples used throughout this booklet show that the success of energy communities does not depend on special reduced tariffs, though it will impact the return on investments. **Most of the successful examples provide an affordable way to contribute to the energy transition, while keeping jobs local and offering more than an investment opportunity, i.e. enabling end-consumers to have a voice in the actions taken and be supported in their own contributions.** The latter could take various means: communication about energy efficiency in buildings, collective purchase actions, one-on-one support or the set-up of shared clean mobility solutions.

Solar Settlement in Freiburg, Germany.
Copyright Rolf Disch Solar Architecture.

Elektrizitätswerke Hindelang e.G., Germany

The cooperative was founded in the 1920s by the citizens of **Hindelang** in order to supply their village with electricity. The initiative generates electricity, organises local energy trading and operates the local grid of **Bad Hindelang**. The municipality of Hindelang holds about 14 % of the cooperative's equity but has only one vote like the other members.

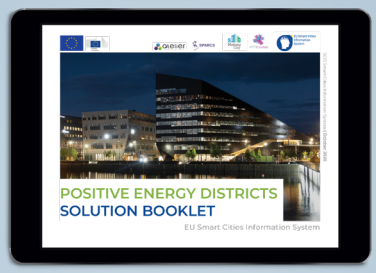
The cooperative is a key driver in the energy transition and an important employer.

Source: ewhindelang.de

LESSONS LEARNED

Lessons learned:

- There are a lot of **successful examples of energy communities** already operational that can be inspirational.
- While there is uncertainty about a potential reduced tariff, the **focus should not be on the economic aspects.** Many more services have proven to add value to participants and to the cities.
- The **city can be the initiator or support the set-up of an energy community**. Bottom-up initiatives can mainly benefit from help with administrative matters, permitting procedures and support in reaching out to stakeholders.
- **Energy communities have to be fair and inclusive**, cities have a decisively important role in safeguarding these principles for the energy communities being set-up with or within the city.
- **Cities should evaluate the long-term plans when providing financial support to emerging initiatives**, i.e. ensuring that the replacement of assets will depend on special support schemes or tailored favourable conditions.
- Gradually and interactively broaden the services and actions the energy community includes, **enabling an effective and valuable contribution of the** energy community to the energy ambitions of the city.



Further reading on Positive Energy Districts:

SCIS Positive Energy Districts (PEDs) Solution Booklet.

ACTIVITIES OF ENERGY COMMUNITIES

Energy communities are entitled to take up a wide range of activities. Those with regards to energy are set out in the directives.

Collective self-consumption

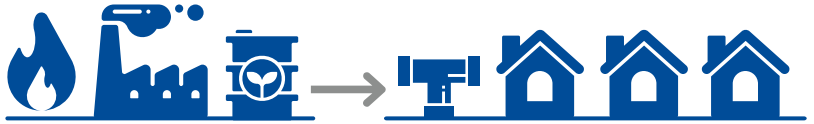
Collective self-consumption implies the instantaneous or near-instantaneous matching of production and consumption within a geographically confined area and between multiple consumers. Depending on the Member State's transposition, the geographical location is detailed or left open and self-consumption is or is not linked with the electricity grid infrastructure.

Collective self-consumption as a concept should again be seen independent of the tariffing. Member States can, but are not obliged to, decide to support and encourage collective self-consumption by applying a cost reduction.

Production

Production is often the primary activity of energy communities. This activity either stands alone or is combined with other activities, such as supply.

- → **In a REC, any production should come from renewable sources.**
- → **In a CEC, this is left open and e.g. a gas-fired CHP is possible.**



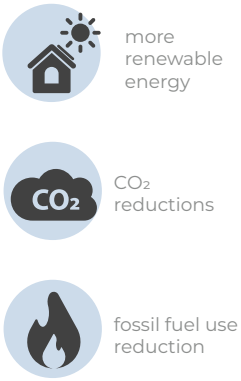
PRODUCTION OF HEAT/COLD FROM AN ENERGY SOURCE;

DISTRIBUTION AND TRANSMISSION FROM THE SOURCE(S) OR PLANT(S) TO END CONSUMPTION;

Supply

In the Clean Energy Package, the concept of multiple suppliers on a single metering point is depicted. This enables the supply of locally produced energy within the energy community while simultaneously allowing the consumer to select a conventional supplier for the energy that cannot be supplied by the community. However, if sufficient production is available, the energy community can act as the single supplier.

In a REC, any production should come from renewable sources:



Ecopower in Belgium

Ecopower CVBA is a **Belgian** cooperative that acts as a producer and supplier of green electricity. The capital raised by the co-operatives is used to finance projects, in co-operation with other co-operatives or not. Its main area of activity is Flanders.

The CVBA collects money to invest in rational energy consumption and green electricity.

In addition, Ecopower informs and raises awareness about renewable energy and the rational use of energy and cooperative entrepreneurship.

A third objective is to bring together green electricity consumers. Since the liberalisation of the electricity market (1 July 2003), Ecopower has supplied green electricity to its shareholders.

By mid-2016, Ecopower had over 48,000 shareholders.

Source: ecopower.be

Distribution

The Electricity Market Directive leaves open the option for member states to allow CECs to take over distribution of electricity. There is no single right answer to whether this should be allowed or not.

In **Germany**, there is a re-municipalisation trend where **local municipalities take over the grid**, but also energy communities such as **ElektrizitätsWerke Schönau eG** have shown to be capable of operating the local distribution grid in a safe and efficient way.

In **Finland**, there was a substantial **risk that only city networks would be of interest to CECs**, whereas rural grids would not. As a consequence, the financially interesting parts of the grid would no longer contribute to the cost of the overall energy infrastructure and hence rural electricity supply would become more expensive. It could move vulnerable people to the city and make the rural area more exclusive.

EWS Schönau eG

After the nuclear disaster at Chernobyl in 1986, a parents' initiative against nuclear power was launched in the small town of Schönau, Germany.

Since the local grid operator had constantly obstructed related citizens' activities, which involved initiatives 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 referenda. However, the excessive, multi-million purchase price quoted by the incumbent could not prevent the activists from continuing their campaign. 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 for the local community.

Source: ews-schoenau.de

Aggregation

Energy communities can aggregate the electricity produced by the production units owned by the community, the consumption profiles of their participants and/or external customers as well as through the energy flexibility of its assets and offer these aggregated loads collectively for purchase or auction in any electricity market. The energy community can do so itself, but tends to use an intermediary who is specialised in this service. Aggregators can **limit a specific asset** widely used in the community or can e.g. **combine the overall energy consumption behaviour and valorise the collective behaviour**.

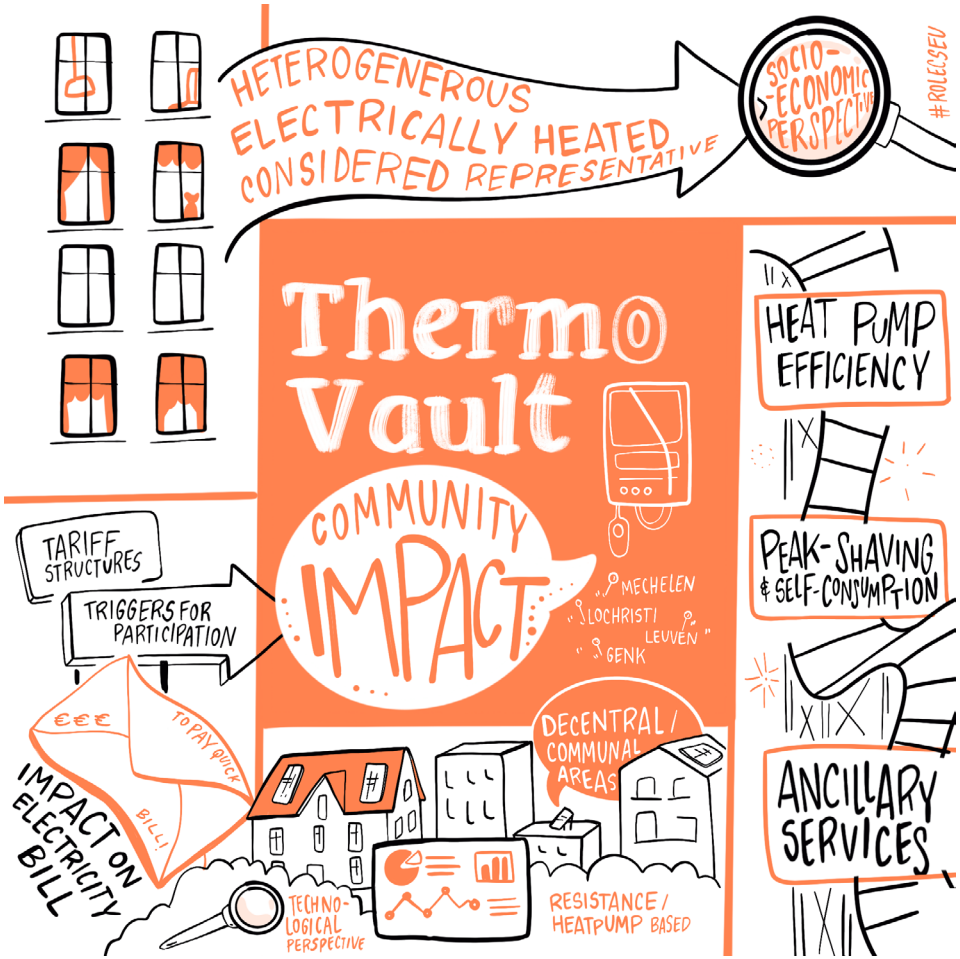
Thermovault: aggregating the flexibility of electric boilers

Electric boilers are a widely used practice. They generally have a simple control ensuring the tank is always filled with warm water. However, that implies unnecessary losses.

ThermoVault therefore helps electricity consumers and utilities to save money while allowing for the integration of more renewables. They developed a simple add-on control that applies a self-learning algorithm to ensure enough hot water is produced for the moment you need it while not having excess losses.

Aside from the typical 15% to 20% energy savings, the retrofit solution prepares the boiler for grid-responsive energy services. Over 1 GW of flexible loads is currently connected to the platform. That way, the aggregated boilers support the further integration of intermittent renewable energy into the energy market.

Source: thermovault.com



Sharing of electricity

The new directives enable energy sharing between the members of an energy community. That implies that **excess energy produced by one member or energy produced by a common asset can be used to supply other members.** The conditions under which this will be allowed depend on the transposition of the Member State and by the rules agreed upon in the specific energy community. Simple sharing rules can be applied or more intelligent hardware, such as smart meters, micro-controllers, batteries and online trading platforms (cf. smart micro-grid) can be implemented. Application of blockchain technology and crypto-currencies such as the **Joulliette** used in the above mentioned example of "de Ceuvel" are also possible. A trade-off between the investment in these technological innovations and the potential gain is needed before deciding the best way forward.

OurPower (peer-2-peer trading) in Austria

The initiative has designed a peer-to-peer platform allowing private electricity producers full market access to Austrian end consumer market. OurPower provides all necessary energy market services, billing, and accounting. As a citizen empowerment platform OurPower promotes and supports regional energy communities as well as Austrian wide energy sharing. The launch of OurPower was financed by its members and a start-up funding of the City of Vienna through the Vienna Business Agency.

Source: ourpower.coop

OurPower is a non-profit European Cooperative (SCE) based in Austria with the aim to re-design the electricity market. It is owned by a growing number of members (Jan 31, 2021: 400), who sell their self-produced power directly to end consumers.

Energy-related services

Energy-related services can also be provided to the members of an energy community, including the services of an EV charging card, a shopping guide for energy-efficient appliances, a mobile application to save energy, rental of power meters, subsidies for insulation and replacement or installation of heat pumps, consultancy services, energy auditing, consumption monitoring, energy monitoring and managements for network operations, etc.

The Mobility Factory (TMF): e-car sharing

TMF is a European cooperative society, founded in 2018 by eight cooperative enterprises. Today, they are operating in **Spain, the Netherlands, Belgium and Germany**. It is governed based on the ICA principles of good cooperative governance. The Mobility Factory offers e-car sharing services to its members through a common platform. The cooperatives jointly manage, operate and improve the IT platform. Though as a member, you are also free to adjust the code to your own needs. This way of cooperatively owning and developing IT code is called "Platform Cooperativism".

Source: themobilityfactory.eu

Tackle energy poverty

Energy communities can be an important way to meet the increasing demand for electricity and alleviate energy vulnerable or poor households by matching local production and demand, resulting in reduced electricity prices.

In **Greece**, municipalities are planning to use income generated by energy communities to build rooftop solar panels and boilers to stimulate energy saving for energy vulnerable or poor households.

Aster in Belgium

On Monday, 26 October 2020, **40 Flemish social housing companies** signed the deed of incorporation of the cooperative ASTER, an initiative of the Association of Flemish Housing Companies (VVH). Tenants and owners in social housing will benefit from a reduction of their energy bill when panels are installed on their roof. The social housing companies want to make an active and structural contribution to a better climate and alleviate energy poverty. With an investment of € 231 million over 4 years, 647 767 solar panels will be installed on 58 433 buildings, producing 207 286 MWh per year.

Source: aster.vlaanderen

Lessons learned:

- **Successful examples are available** from throughout Europe, some touching a single element like e-cars, others going as far as taking over a cities' energy production, distribution and supply.
- Several of the described examples provide **multiple benefits** to maximise the value for participants. Energy savings and tailored advice are some examples that have proven to be successful.

- In many cases, the set-up **did not depend on financial support from public sources**.
- The investment in sharing platforms or crypto-currencies with the needed metering and communication needs to be seen in relation to the potential gain. A realistic view avoids a lock-in where the main advantage is for the intermediary instead of **directed towards the community.**

SOCIETAL & USER ASPECTS

SOCIETAL AND USER ASPECTS

Energy communities aim to deliver important social and societal advantages. However, there is no “one size fits all” approach. Socio-economic differences, urban planning, climatic conditions as well as culture and habits influence the energy community model and the impact it can have.

Social cohesion and trust

Energy communities have the potential to **foster community cohesion across ideological boundaries**, and can further contribute to increasing **trust in local representatives and municipal governments**.

Good examples are widespread, e.g. the earlier mentioned Leuven2030 initiative. But the city-wide approach is not the only way it can be done:

- **Community cohesion,**
- **Local heroes,**
- **Employment opportunities,**
- **Increase social acceptance,**
- **Foster energy democracy.**

Easter egg hunt gathering in a community in Oud-Heverlee, Belgium.

Community cohesion

It is important that some form of prior social cohesion exists amongst the community members. In fact, a prior social cohesion is a key ingredient in mobilising villagers to participate in an energy community.

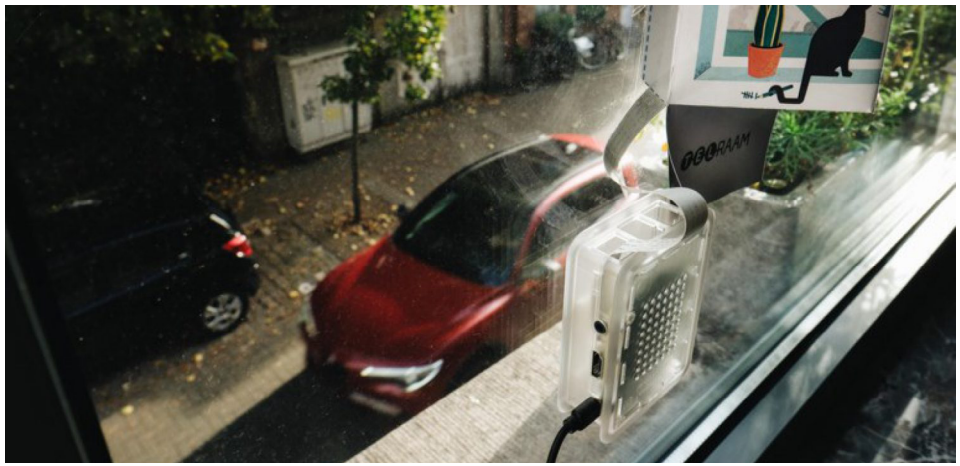
When social cohesion is missing, this can be fostered through **positive campaigns** that unite people, such as energy saving competitions, actions to gain more insight into matters that influence the liveability and safety of the community, but also by involving people in the decision-making process in order to foster trust. The **Telraam project** is a great example of an easy way to foster community feeling and increase the interaction with local politicians and civil servants. Data is collected on local traffic to objectively demonstrate the traffic situation in a local street as well as what kind of an impact a measure in one street can have on another. Noise and air quality measurements are also relevant, but often less tangible or understandable for citizens. The success of a simple system such as Telraam is that it touches a topic that matters to all generations, that all see and experience daily and where their own measurements or those of someone in the street are relevant and contribute to drawing an overall picture of the local situation.

Telraam project

Within the Telraam project, Transport & Mobility Leuven co-developed an integrated application based on **low-cost hardware** and a **public online platform** allowing citizens to perform traffic counts. Citizens can put a small metering device and a microcomputer near their window to take part.

Pedestrians, cyclists, cars and heavy vehicles are each counted individually when passing along the traffic count sensor. The resulting **traffic data** can be used to perform traffic engineering studies. Like this, citizens and citizen platforms collect objective data, allowing them to **engage in a dialogue with their local government**. This can potentially result in actions such as a modification of the driving direction, the re-design of the public space, an improvement of the cycling conditions, or a modification of the parking facilities. In the European project WeCount the traffic counting data with Telraam are linked to e.g. air quality measurements.

More on: telraam.net



Local heroes

Local heroes can be another initiation of an energy community. Usually, this is a **person with a certain social standing or involvement in the community, as well as knowledge of the local area.**

Furthermore, it is someone who is so dedicated and passioned about the cause, that he or she is willing to invest his/her spare time and resources into it.

Such local heroes are key for bringing members together and creating a community feeling. In addition, they can save the energy community a lot of financial resources by taking on responsibilities that otherwise would have to be contracted to external parties.

EWS Schönau eG

Ursula Sladek and her husband Michael Sladek were great examples of **local heroes.** They were the founders and true protagonists of Die Elektrizitätswerke Schönau EWS.

She was a high school teacher, he a doctor and an independent city councillor. Today, both their sons are in the board of directors of the EC.

Source: Cappelletti, F., Vallar, J-P, Wyssling, J., 'The Energy Transition Chronicles', Energy Cities, January 2016

Photo of Ursula and Michael Sladek, the Courtesy of Frank Dietsche, EWS Elektrizitätswerke Schönau eG

Such local heroes inspire others, organise activities that enable **effective engagement and foster energy citizenship**. In the above mentioned energy community of Oud-Heverlee, the local initiator enabled energy monitoring in the majority of houses and organised a collective purchase action for PVs.

The community's increased energy awareness led to numerous replacements of lamps and to numerous electrical vehicles replacing diesel fuelled cars.

Employment opportunities

Creating local employment opportunities can **help municipalities to counteract the drain of local talent to big cities.** In Germany, for example, the energy community of **Schönau** employs about 110 people, mostly young people raised in and around the village of Schönau. Also in **Hindelang**, the energy community is a decisive local employer. In Denmark, on the island of **SamsØ**, the initiator of the energy transition project took the concept further and started organising courses and visits, turning the energy transition of the island into a long lasting business.

Playful ways of learning on capacity of appliances in Oud-Heverlee.

Increase social acceptance

Energy communities have the potential to **establish a dialogue** between specialists and non- specialists in order to achieve a **wide and long-lasting consensus** on complex multi-level investment and policy decisions related to energy strategies for a low-carbon future. Research has shown that, when citizens are part of the benefits and the decision-making process, they will feel more fairly treated, which increases the level of support for the outcome[9]. Hence, energy communities are a way to overcome so called NIMBY (Not In MY BackYard) comments. The Belgian **Wasewind** is a good example of such a local cooperative project.

Wasewind

Wasewind is a Belgian cooperative active in the Waasland area. They invest in local windpower with co-ownership of the local end-consumers. In order to foster and maintain the acceptance of their projects, they spend considerable efforts in user-engagement. An annual event for all cooperation partners is one of these activities. It is not just a gathering to discuss results and explain further plans, it is a true get-together with a new activity or surprise every year.

Source: www.wasewind.be

9 T. Bauwens and P. Devine-Wright, 'Positive energies? An empirical study of community energy participation and attitudes to renewable energy' (2018) Energy policy 118.

Foster energy democracy

Energy communities can help increase local legitimacy of municipalities by extending principles of democracy to the socio-economic sphere by collaborating with or **giving citizens and SMEs more control over energy, either indirectly through representative bodies (e.g. municipalities) or directly through participation in an energy community.**

Collaborative city planning © SCIS

Pre-testing of VR visit to the top of a large scale wind-turbine for the annual Wasewind event in fall 2019.

Lessons learned:

- **Community cohesion increases the liveability of communities.** It creates social cohesion and encourages dialogue and exchange of experience over various topics, easier borrowing of tools and offering each other help.
- Cities should offer such communities **access to community centres** to support them.
- Energy communities typically have **a single person (or a small group of persons) that initiates the transition process.** Cities should be open to communicate with that person and provide help where possible.

- Energy communities are a way to **reduce** the NIMBY phenomenon.
- Aside from economic advantages or energy savings, communities can **lead to improved living** conditions by cooperating on aspects such as traffic or organic food.
- Large initiatives can lead to the creation of **local jobs**.

BUSINESS MODELS & FINANCE

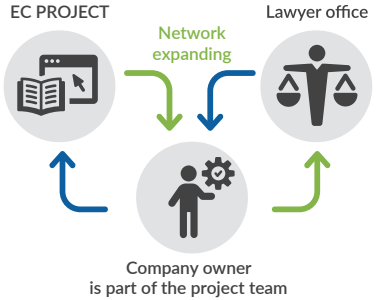
Green Energy Park, ©VITO

BUSINESS MODELS AND FINANCE

There are various ways member states have transposed the directives and specifically the parts related to energy communities. The potential reduction of tariff is limited and in some Member States not even foreseen due to the lack of a tangible benefit of energy communities to the operation of the grid. The future grid has to be flexible. Energy communities can be one way of organising such flexibility, but it is not the only way.

Foster local economic growth/create local value

Energy is the key driver of any industrialised economy. The **decentralisation of technology unlocks the potential for local governments to take control over energy technology, in collaboration with citizens and industries, and to generate additional income through flexibility services or sales of energy.** Funds can be used to invest in other community projects that foster local economic growth and contribute to its prosperity. In **Germany**, for example, EWS Schönau eG owns the local distribution network and outsources the maintenance works to local companies, which allows the taxpayer's money of the local residents to be kept inside of the community.



Hilde Derde is an example of a local lawyer who managed to further expand her office network based on learnings on the energy community projects in Oud-Heverlee where the company owner is part of the core team. Photo above: metha.be

Mobilise private capital

In **Germany**, it is estimated that individual citizens and communities installed 34% of the total installed capacity of renewable energy by 2012. **Nearly 50% of the total installed PV capacity and 25% of the total installed onshore wind energy capacity is in the hands of individual citizens or communities**[10]. Individual citizens have the opportunity to contribute and co-invest resources and consequently benefit from the economies of scale to spread the risk of investment in energy-related activities.

Mobilising private capital can be done **in a community of any size**. The Oud-Heverlee community with around **40 households organised a collective purchase action for PV, adding five installations to the already 12 installed ones.**

10 See in this regard Amecke, H., 'German Landscape of Climate Finance, Climate Policy Initiative' (2012) Climate Policy Initiative 2016, pp. 1-23.

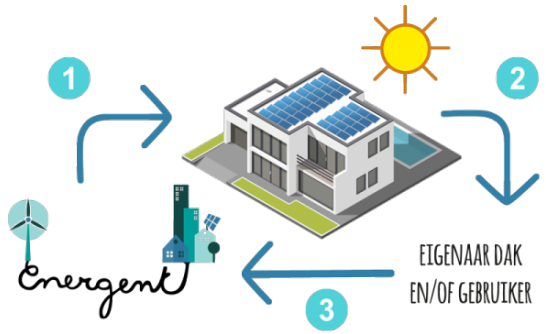
Energent

Energent is a **local cooperative** in the area of **Ghent, Belgium**. Next to the self-invested solar farms and other renewable energy projects, they also provide a lot of user support for renovation & the selection of renewable energy technologies.

For this, they are partly dependent on local, regional and even European funding. However, they have an impressive track record: every euro funding they received so far has led to 20 euro of investment in local renewable energy systems.

Energent has a dedicated and patient team that **reaches out** to vulnerable and other consumers, **ensuring contributing to a fair and inclusive energy transition**.

Source: www.energent.be



Energent facilitating use of solar energy produced by 7.759 PV panels on office buildings. Image souce: Energent.be

Avoid distribution grid expansion costs

Based on the aggregated community profile, **energy communities can provide flexibility to the local grid operator** through **demand-response services**. This flexibility allows for an **increased penetration of renewables without the need for investment in expansion of the local distribution network**. However, grid investments are often substantially cheaper than other strategies. A small distribution grid operator in **the Netherlands** estimated that adapted behaviour of their end-consumers would lead to 20 million euro of savings annually. Putting it into perspective: they have 2 million connections, so that is about 10 euro a year per connected end-consumer.

The flexibility market at low and medium voltage level is an important part of the Clean Energy Package. Potentially more impactful than energy communities. However, the conceptual design for this market is yet to be initiated. It is important to understand that orchestrated behaviour, whether in an energy community or through aggregation, can indeed avoid congestion. But congestion is a local phenomenon and might be temporal in nature. Also, the higher the flexibility, the lower the potential price that will be paid for such a service.

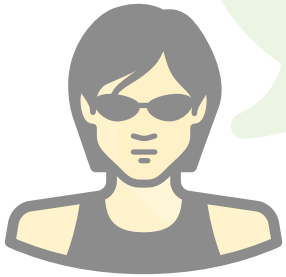
Therefore, it is important to make sure that an energy community, that should not have profit making as its purpose, considers **value stacking** as a key approach to a sound and sustainable financial management of the community resources.

Lessons learned:

LESSONS LEARNED

There are various ways Energy communities can lead to private capital being used for renewable energy projects. **Be creative, work on examples, exchange experiences.**

Be realistic in the potentially limited or even non-existing reduced tariffs for peer-to-peer exchange between community members.



Deferred investments is only valid for specific locations with certain characteristics of the grid. **Engage early with the DSO** and be rational about the value created.

GOVERNANCE AND REGULATION

GOVERNANCE AND REGULATION

The rights and obligations of energy communities have been conceptually described in the European directives. The transposition leads to different local regulation and legislation. However, all Member States have to ensure a level-playing field, no excessive administrative burden, clear and consistent regulation, etc. These matters are outside of the control of a city or municipality. Therefore, below, the focus is on what a city can do to support energy communities.

Encourage community participation or investment quota

When issuing environmental and building permits, municipalities can impose, through local policy and regulation, minimum community investment and participation quota in new energy projects.

Mandatory investment opportunities

Municipalities can require mandatory investment opportunities for communities living in proximity of renewable energy projects that participate in renewable energy subsidy schemes.

In **Ireland**, the government has introduced in its high-level design paper a similar mechanism, requiring investment opportunities for communities living in a radius of 5 km of the project that participates in such a scheme. The provision of the opportunity is mandatory, the actual size of the participation in the investment is not.

In **Denmark**, through the **Promotion of** Renewable Energy Act, developers are required to offer 20% of overall ownership shares of wind turbines of over 25 meters in height to eligible persons. The law furthermore allocates a right to buy the first 50 shares to eligible individuals that live within a 4.5 km radius of the project. Remaining shares are offered up to eligible individuals that reside in the local municipality.

A collaboration between the cities of Emmen/Haren – the Netherlands/Germany

For “The Smart Energy Region”, the municipality of Emmen and Haren have collaborated with the aim to install a regional, decentralised and cross-border energy system in order to connect local supply and demand and keep benefits associated with renewable energy in the region. **Locally sustainably generated electricity is exchanged and managed across national borders.** From 2025 onwards, there will be a regional energy market Emmen/Haren.

Source: sereh.eu

Mandatory participation quota

Aside from investment opportunities, municipalities are also able to require minimum participation quota for local communities in decision-making in the development and/or operation of energy community projects. In **Flanders, Belgium**, this was foreseen by the provinces of **Oost-Vlaanderen and Limburg**, which require a minimum participation quota of 20% (10% for local municipalities and 10% for citizens) in ownership and management of wind turbine projects. However, this provincial decision was refuted by the Flemish government due to lack of a legal basis in the Flemish Energy Decree. Municipalities can include these **minimum participation quota as part of their assessment of local socio-environmental impact in permitting procedures or provide extra points for such a participation**.

Learn from others and share your knowledge and expertise

Before deciding for co-creation check if it is the best strategy

Let citizens explore different perspectives

Participate in an energy community

Inter-municipal cooperation

Projects do not have to be on a city level or even within the boundaries of a city. Cooperation can be initiated between districts of different cities or between multiple cities.

Public utility company with citizen participation

Historically, many grids were owned by cities and municipalities. For cost saving and for increasing need of in-depth expertise, city networks merged into bigger entities. But more and more cities and municipalities are re-evaluating this decision.

The European directive leaves the Member States the opportunity to allow energy communities to take over the grid. However, many Member States are hesitant and unlikely to advance in that direction. There are several reasons for that:

- The current model is based on socialising the system costs. Networks in cities have a higher income per meter of cable compared to rural networks. Moving away from that principle risks to increase energy poverty in rural areas, which could lead to more vulnerable families being obliged to leave the countryside and move to the cities, while the higher societal classes could do the opposite.
- Energy communities will remain connected and use the infrastructure of higher voltage levels, as having numerous fully disconnected and 100% self-sufficient independent energy systems would lead to dramatic overinvestment in assets. The cost of the infrastructure is not lower because it is only used once in a while. Hence, all need to contribute to it.

The Berlin Energy Roundtable - Germany

The **Berlin Energy Roundtable** was developed by a social movement coalition, which was formed in 2011 to campaign for a re-municipalisation of the electricity grid, but also to foster a transition to renewable energy and to address social issues such as energy poverty. While the initiative is owned by the local municipality, it provides different innovative pathways for citizen participation in decision-making, such as public meetings at a municipality level, publicly accessible key documents, and an extended steering board with representatives from the City Council and elected citizens.

The initiative **gained the support of 600.000 citizens**, but in the end missed 21.000 votes in order to take over the public grid.

Source: berliner-energietisch.net

Photo source: berliner-energietisch.net

Cities as initiators of energy communities

Cities themselves can also be the initiators of energy communities. The **City of Mechelen, Belgium** has recently started the evaluation of an energy community as a concept on a new development.

The **University of Brussels, VUB**, is setting up an energy community on a site that includes research buildings and commercial companies. It is important to note that, as a city, setting up a city-wide energy community with end-consumer participation requires careful evaluation.

A city receives money through tax payments of its citizens. Setting up an initiative to which the most vulnerable consumers, or maybe simply those that decided to invest in home renovation for this particular year, cannot participate, includes a risk that materialised e.g. in the earlier described case of **Samsø** (Page 11).

A city-wide initiative cannot be for the benefit of a selected group of citizens only: the most vulnerable one, the one that cannot contribute financially, cannot be the one that contributes to a potential financial gain of the others.

LESSONS LEARNED

Lessons learned:

While a lot is not in the hands of cities and municipalities, there are a number of measures that cities can take in order to **support active participation** of end-consumers in the energy transition:

- A city can **favour offers with citizen-participation** and hence directly or indirectly put such a requirement in its call for developers of renewable energy projects.
- A city can be the **driving force** in the development of an energy community. Though attention is to be paid to an inclusive approach with regards to those citizen that cannot co-invest.
- **Cities can collaborate** with nearby cities on energy transition plans.

FAVOUR OFFERS WITH CITIZEN-PARTICIPATION

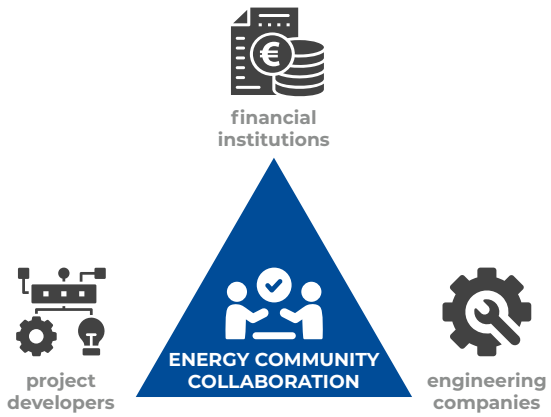
COLLABORATE WITH NEARBY CITIES

BE THE DRIVING FORCE IN THE DEVELOPMENT OF AN EC

PARTNERS AND PEOPLE

PARTNERS AND PEOPLE: EVERYONE IS DIFFERENT

Energy communities can significantly contribute to increasing the share of renewable energy, fostering social cohesion and trust, and increasing public acceptance of renewable energy projects. But it is important to take everyone along.



Finding the right partners

Energy communities will most often need to collaborate with other partners to plan, develop and implement a project, including financial institutions, engineering companies and project developers. Such collaborations provide the energy community, among others, with access to technical expertise, additional finance and business planning.

Members with exceptional expertise

The set-up of an energy community will necessitate exceptional expertise in terms of law, economics and engineering as well as perseverance. It is therefore key for energy communities to have members within their community from different backgrounds in order to pool their skills and use them to develop the energy community, without having to contract external specialist for substantial costs.

In the case of **EWS Schönau**, Martin Halm is the managing director in EWS Netze GmbH: the company in charge of the distribution networks. He was contacted by M. Sladek to operate the local distribution network due to his relevant experience as he worked for several years in the electricity sector at the Stadtwerke in Bruchsal (a water and energy distribution company). He decided to join EWS Schönau at the start-up phase to help operate and manage the local distribution grid.

Every citizen is different

In order to set up an energy community, the core initiators have to reach out to a broad range of people, i.e. citizen with different interests and different characters, that are seduced with different messages and that take decisions with different speed. Categorising users and gaining understanding in the linked communication and support needs can result in a more effective upscaling. Information on user categorisation is scarce, but cities can cooperate with local research institutes to support on that.

ROLECS

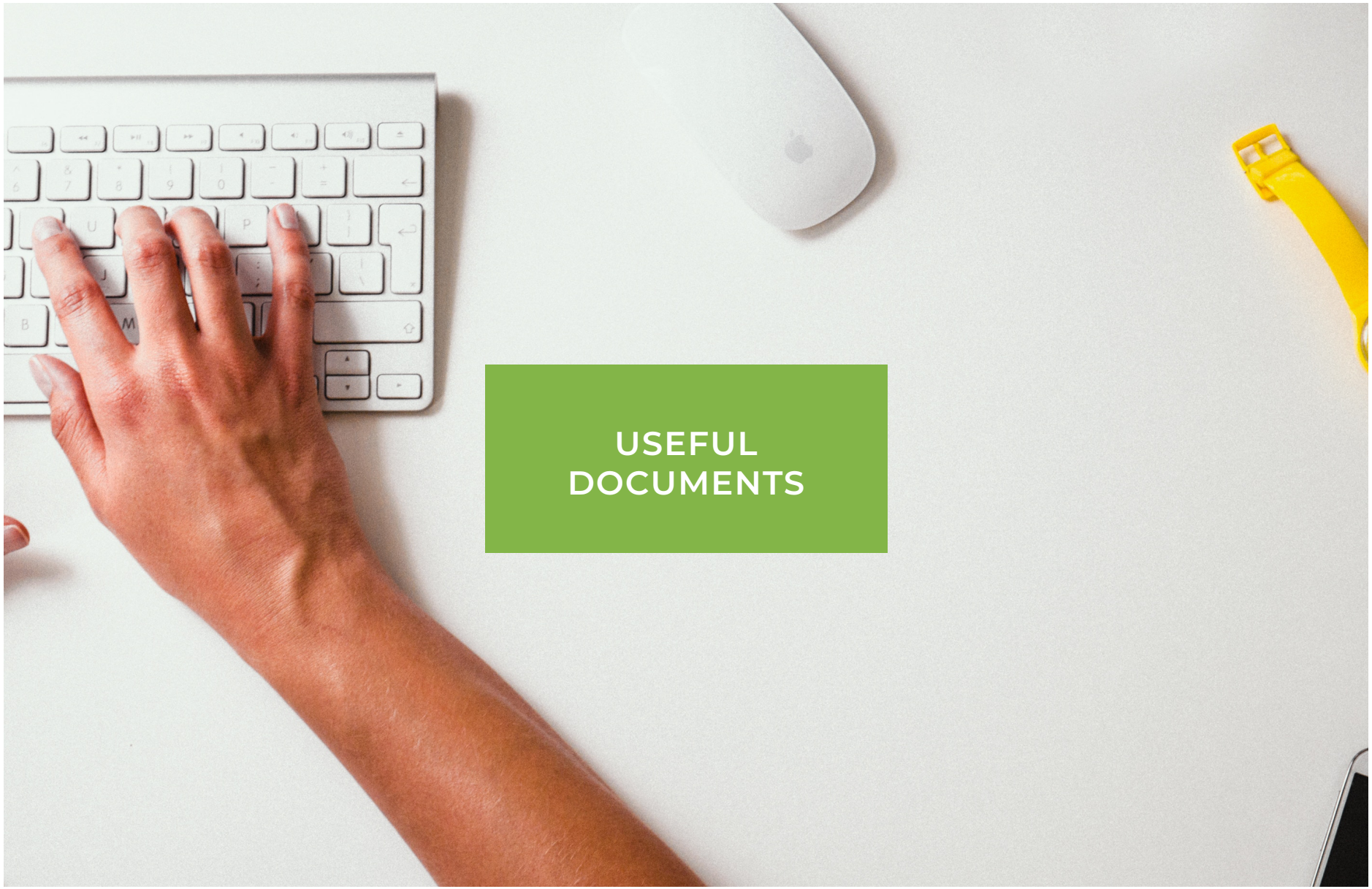
In the **Belgian project ROLECS**, the company imec interviewed over 700 people about their intentions and concerns with regard to joining an energy community. They ended up categorising the citizen into three groups:

"Convinced Carl" had the highest intent to join an energy community, most influenced by his perceived behavioural control. Social norms and community identity are less important to him. The best way to convince him is by providing financial, technical and juridical information to answer his need of control.

"Potential Paula" had the second highest intent to participate in an energy community. This intent to participate is most influenced by her social norms (the opinion of friends and family about her participation in an EC). Paula will probably not be amongst the first to participate but can follow the example of friends and family. The best way to convince her is by creating word-of-mouth from friends and family to affect the intent to participate in an energy community (social norms).

"Sceptical Steve" had the lowest intent to participate in an energy community. This intent to participate is most influenced by his attitude (what he thinks about energy communities). Community identity and social norms have a relatively high (and significant) impact on his intent to participate. The best way to convince him is by creating a positive attitude towards energy communities by informing him of successful examples.

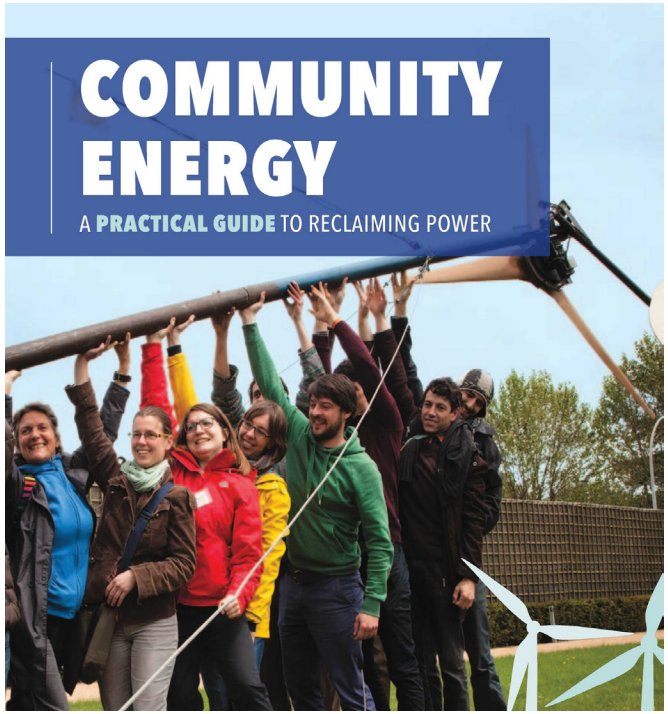
More on: www.rolecs.eu



USEFUL DOCUMENTS

USEFUL DOCUMENTS

- → Bridge Taskforce Energy Communities First report
- → JRC Report: Energy Communities: an overview of energy and social innovation
- → CEER report on energy communities
- → CEER-BEUC 2030 Vision for energy consumers



RESCOOP "Community Energy: A practical guide to reclaiming power"

USEFUL LINKS

Compile project: the main aim of COMPILE is to show the opportunities of energy islands for decarbonisation of energy supply, community building and creating environmental and socioeconomic benefits.

STORY Horizon2020 project: a European project researching new energy storage technologies and their benefits in distribution systems and involves 18 Partner Institutions in 7 different European countries.

ROLECS project: a research project that intends to gain a deeper understanding of the development and role of Local Energy Communities (LECS) in Belgium and in Europe.

RESCOOP.eu project: European federation of citizen energy cooperatives. A growing network of 1.500 European energy cooperatives and their 1.000.000 citizens who are active in the energy transition.

SEREH project: the municipality of Emmen and Stadt Haren (Ems) are working together on a decentralised cross-border electricity and energy market. It is a unique project in Europe. Locally sustainably generated electricity is exchanged and managed across national borders. In 2025 there will be a regional energy market in Emmen/Haren. SEREH fact sheet brochure available here.

DECIDE Horizon2020 project: aiming to gain a better understanding of how energy communities and energy efficiency services are established and managed. It also intends to identify which kind of communications and interactions work best to encourage participation in energy communities for specific types of individuals and groups, and to test and transfer knowledge in pilot projects across Europe.

CONTRIBUTION

EU Smart Cities Information System

SCIS

The Smart Cities Information System (SCIS) is a knowledge platform to exchange data, experience and know-how and to collaborate on the creation of smart cities, providing a high quality of life for its citizens in a clean, energy efficient and climate friendly urban environment. SCIS brings together project developers, cities, research institutions, industry, experts and citizens from across Europe.

SCIS focuses on people and their stories – bringing to life best practices and lessons learned from smart projects. Through storytelling, SCIS portrays the "human element" of changing cities. It restores qualitative depth to inspire replication and, of course, to spread the knowledge of smart ideas and technologies - not only to a scientific community, but also to the broad public!

smartcities-infosystem.eu

SCIS is funded by the European Union

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