13 Democratising renewable energy production

A Luxembourgish perspective

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Box 13.1 Students for citizens' energy: objectives, concepts and methods

During the academic year 2015–2016, our peer group set out to investigate how the challenge of democratising and developing renewable energy production in Luxembourg could be met.

This was done in the framework of the certificate in 'Sustainable Development and Social Innovation' of the University of Luxembourg, of which peer group work is a central component, as it offers "a co-designed and systematic process of participatory enquiry that engages diverse perspectives from a wide range of scientific expertise, professions, interests, and experiences in a transformative learning process" (König, 2015). The main learning outcome is intended to be collaborative co-creation of shared knowledge on complex problems of sustainability.

The peer group consisted of five mature students supported by an experienced mentor, all of different nationalities. The peer group members, three females and two males, hold university qualifications in industrial engineering, philosophy, European studies, international relations, psychology, mathematics, economics and business administration. They range in age from 38 to 63 and originate from Germany/Denmark, Italy, Mexico, Poland and the United Kingdom.

The local mentor, the Luxembourgish president of one of the energy cooperatives analysed, provided guidance and invaluable knowledge of the renewable energy scene in his country.

The starting hypothesis of the peer group project was that the energy transition not only offers the opportunity of greater involvement of citizens in energy production, but actually makes it necessary. Technological transition needs to be accompanied by social innovation if wider systemic change – that is, the replacement of fossil fuel by renewable energy sources – is to be successful.

Adopting a normative stance, the peer group identified the Dutch theory of socio-technical transition presented during the certificate course as a suitable conceptual framework. The multi-level perspective offered by the theory allowed the peer group to move from the case-study of two (of the

three) existing energy cooperatives in Luxembourg, EquiEnerCoop and TM EnerCoop, to the examination of conditions for the spreading of citizens' participation and, finally, to the development of ideas for even more "democratic" forms of citizens' energy production and consumption, for which the group formulated concrete policy recommendations intended to lead to a paradigm shift in the energy market and beyond.

Accordingly, the peer group approached the topic from the perspective of social innovation, pursuing the question in which way and under which conditions energy cooperatives could become agents of a sustainable transition in Luxembourg or, to put it differently, drivers of democratisation and change at a transformative scale.

The challenge: renewable citizens' energy

In this chapter, we define "energy democracy" and provide arguments for citizens' energy. Energy from renewable sources (i.e. wind, solar, hydro, biomass and geothermal energy) has become a cornerstone in policy strategies for sustainable development, as a substitute for fossil fuels and, thus, a pre-condition for the transition into a low-carbon era. The increasing use of renewable energy is one of the principal means by which governments in Europe and elsewhere seek to counteract climate change, the depletion of natural resources (e.g. fossil fuels) and pollution, to mention but a few of the environmental challenges that threaten the very survival of our societies, economic systems and planet. Under the European Union's 2020 policy framework, Luxembourg has committed to increase the share of electricity generated from renewable energy sources from the current 4.5 % to 11 % by 2020.

Many scholars and stakeholders in Europe agree that a significant increase in renewable energy generation will require not only technological change, but also a paradigm shift in the way the energy market is organised. Energy systems are a critical infrastructure, vital for the functioning of our societies and economies. In all countries a few big players (typically state-owned monopolist structures, many of which have subsequently been turned into large commercial corporations) have traditionally dominated the market, producing and distributing fossil fuel–based or nuclear energy from giant power plants via centralised unidirectional grids that, in their turn, have also been operated by state-owned or privatised monopolists. Moreover, European countries have been highly dependent on primary energy imports of oil, natural gas and coal from non-democratic countries (such as Russia, Saudi Arabia, the United Arab Emirates and Iraq[1]). To sum up, in many ways the energy market represents an interest- and profit-driven network, with close links between policy and business and a high degree of import dependence. The role of citizens is limited to that of passive consumer (and voter). It is this context that explains the significance of "energy democracy".

In a more general sense, the term can be used to promote the ideas of:

- Ecological sustainability: using "home-grown" renewable energy sources
- Macroeconomic independence from fossil fuel–exporting countries

- Market diversity and less market dominance by large commercial enterprises
- Consumer protection: affordable and transparent prices and free choice of energy provider

The importance of participatory planning and an acceptance of renewable energy installations with and by citizens are also often identified as issues. Wind parks, biomass plants and solar panels are mostly situated close to local communities, often in rural areas where they are likely to be perceived as a disturbance. This clearly calls for a new planning culture and participatory decision making at a local level.

However, of even greater concern in our context is the more specific sense of the term, where energy democratisation implies the idea of renewable energy as a "common good" that should be managed by the citizens themselves at the local level:

> From the perspective of social justice, more attention therefore must be paid to the way in which decentralised renewable energy sources are managed. In a world where energy is scarce, these sources of energy will mean income for the operators. Citizens and users therefore have every interest in keeping this local energy production in their own hands as much as possible. Governments too have every interest in anchoring decentralised renewable energy with the users as much as possible so that the added value of the production also benefits society. (REScoop, 2015, p. 60)

In this sense, defining characteristics of energy democratisation are:

- Decentralisation and regional value creation,
- Financial participation in and co-ownership of renewable energy installations by citizens.

This last point brings us to the concept of "citizens' energy" as defined by Leuphana University Lüneburg and the institute trend:research, being energy owned – and controlled – by citizens either individually (private households or farms) or collectively (e.g. by cooperatives, in which citizens hold at least 50% of the voting rights) (TRLU, 2013, p. 15).

It is on the collective ownership and exploitation of renewable energy that our peer group (Box 13.1) has concentrated, as cooperatives represent a new form of social (and commercial) organisation (Box 13.2) that could lead to the move away "from a centralised, oligopolistic energy system to one that is decentralised and above all democratically controlled and operated" (REScoop, 2015, p. 69).

Box 13.2 Cooperatives and energy transition

According to REScoop.eu, the European federation of groups and cooperatives of citizens for renewable energy and energy efficiency, in 2016 there were some 2,400 such cooperatives in Europe, mostly in Western Europe, and particularly in Germany, Denmark and Austria. Of these, about half, representing 650,000 citizens, are members of the federation. Its members have

invested EUR 2 billion in electricity generation equipment, with a total capacity of 1 GW. The importance of the role of citizens in increasing the share of renewable energy, and as drivers of the energy transition, is demonstrated by the case of Germany. Research by trend:research and Leuphana University on the German "Energiewende" ("Definition und Marktanalyse von Bürgerenergie in Deutschland", October 2013) showed that in 2012, total renewable energy generation capacity in Germany was some 72.9 GW. Of this, 41% was owned by institutional investors, 12.5% by energy companies and 46% by citizens. Within this 46%, 25% of the total was in private ownership, and citizens' energy cooperatives accounted for some 9% (c. 6.7 GW). (TRLU, 2013; RESCoop, 2016)

One way of looking at energy cooperatives is as social enterprises. Applying the approach of the European Social Enterprise Research Network (EMES) to social enterprise, one can define the following main aspects of energy cooperatives (Defourny & Nyssens, 2012, pp. 8–9):

- Economic and entrepreneurial: producing and selling (renewable) energy from collectively financed and owned installations, mainly based on voluntary work, limited profit distribution among the members;
- Social (and environmental): an explicit aim of benefitting the community and environment; surpluses are reinvested in the community or new projects;
- Participatory governance: equality of members and collective decision making, each member has one vote.

Based on these characteristics, social enterprises are deemed to have a special role to play in social innovation, as "the value they create is necessarily shared value, at once economic and social" (EC, 2013, p. 7). Many scholars emphasise the potential of social entrepreneurs to introduce new services, methods of production and forms of organisation. As Geoff Mulgan puts it, "social entrepreneurship sits within a broader context of social change", typically drawing "on the often invisible fecundity of tens of thousands of individuals and small groups who spot needs and innovate solutions" (Mulgan, 2006, pp. 75–76).

The vision of citizens and communities "taking over" the energy market, getting together to collectively produce, share and consume their own energy is put forward by a number of scholars, perhaps most prominently by Jeremy Rifkin:

> In the coming era, hundreds of millions of people will produce their own green energy in their homes, offices, and factories and share it with each other in an "energy Internet" [. . .]. The democratisation of energy will bring with it a fundamental reordering of human relationships, impacting the very way we conduct business, govern society, educate our children, and engage in civic life.
> (Rifkin, 2011, p. 2)

Rifkin believes that, in the future, most people will be prosumers, installing solar panels on their roofs to generate and to consume their own electricity and selling surpluses to others. This "would democratise the production and distribution of

energy by creating millions of mini energy entrepreneurs", leading to a new Collaborative Age and the Third Industrial Revolution (Rifkin, 2011, p. 48).

Although Rifkin's vision is not uncontested, he is not alone in believing that decentralisation in the energy sector will give rise to "fundamental shifts in social organisation that affect all areas of people´s lives" with far-reaching implications for all spheres of society, such as politics, economics and culture (Gross & Mautz, 2015, pp. 8–9).

The energy source most accessible to citizens is solar energy (ranking before wind energy), due to the relatively affordable and continuously decreasing cost of investment, high availability and relatively easy rooftop installation (COM/2015/080, European Commission, p. 15). These factors have contributed to the fact that, according to the Ren 21 multi-stakeholder network, global solar energy generation has more than trebled over the past four years. In 2015 alone it grew by 32.6% according to the BP Statistical Review of World Energy (BP, 2016, p. 5).

In the same way, in Luxembourg, the three existing energy cooperatives have made solar energy their main business. Leaving the conceptual level, we shall now describe the peer group's approach and methodology before turning to the case studies.

The methods used

The group adapted the Dutch theory of socio-technical transition (Geels, 2002; Verbong & Geels, 2007) to the energy sector and the wider societal context in Luxembourg, related to the three levels of social organisation and innovation identified by the theory (see Figure 13.1 and Box 13.3):

1 Micro-level: energy cooperatives and other local and social initiatives (or "niches");
2 Meso-level: spreading of initiatives resulting in wider changes in the energy market and social organisation throughout society ("patchwork of regimes");

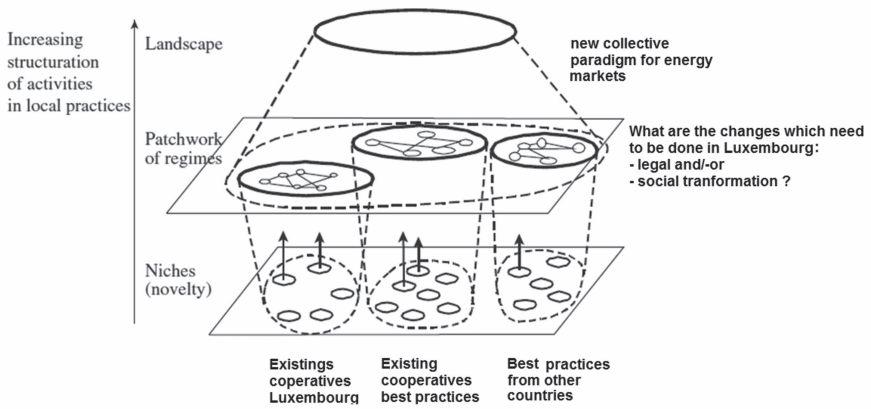

Figure 13.1 The social-technical transition model for provision of renewable energy in Luxembourg

Source: Based on Geels, 2002

3 Macro-level: paradigm-shift penetrating the entire fabric of society (or "landscape"), marking the transition to a new era.

Starting at the micro-level, the group chose observational studies as the methodology best suited to analysing the two energy cooperatives and the policy framework: conducting interviews with executives of the cooperatives (presidents and board members) as well as regulators, attending meetings and conferences of energy stakeholders in Luxembourg and carrying out on-site visits of solar installations. The case studies showed that energy democratisation in Luxembourg has begun, but that many challenges remain to be met in order for the cooperatives to become more than isolated initiatives (or "niches"), for citizens' participation to become more widespread and for a paradigm shift to take place.

The methodology is presented in Figure 13.2.

For benchmarking purposes, on-site visits to renewable energy projects and interviews with a cooperative and architects were also held in Germany. They showed that democratisation and citizens' participation could be taken yet another step further by moving towards the "prosumer model", by which citizens consume their own renewable energy directly.

These findings were presented at the General Assembly of EquiEnerCoop and were published on an energy blog.[2]

In order better to understand the current EU policy framework, enabling and constraining legal factors affecting any expansion/scaling of the prosumer model and potential upcoming policy initiatives, the peer group members further attended a public hearing in Brussels on energy prosumers as the possible new "rising stars of the [EU] Energy Union".[3]

Box 13.3 On Geels

The benchmark for our studies was the work of Verbong and Geels (2007, 2010), who developed a theory of transition looking at socio-technical transformations in a multi-level perspective (MLP) in the context of an analysis of the Dutch electricity market and its transition towards sustainability. They considered social networks as well as new renewable energy options, structural changes in the existing electricity market and changes in rules and regulations which support or block transition. The MLP considers interactions between niche innovations and existing regime developments in a broader environment (Verbong & Geels, 2007). Sustainable transition on the energy market could happen only if and when innovations introduced by different actors in "niches" (novel renewable energy projects) link up and are reinforced by any developments in the existing regime and broader socio-technological environment (macro level). The socio-technical regime consists of three dimensions (Geels, 2002):

- Network of actors and social groups;
- Formal, normative and cognitive rules that guide the activities of actors (laws, rules, standards and regulations, guiding principles, relationships);
- Material and technical elements; these include physical resources, such as grid, generation plants and renewable energy installations.

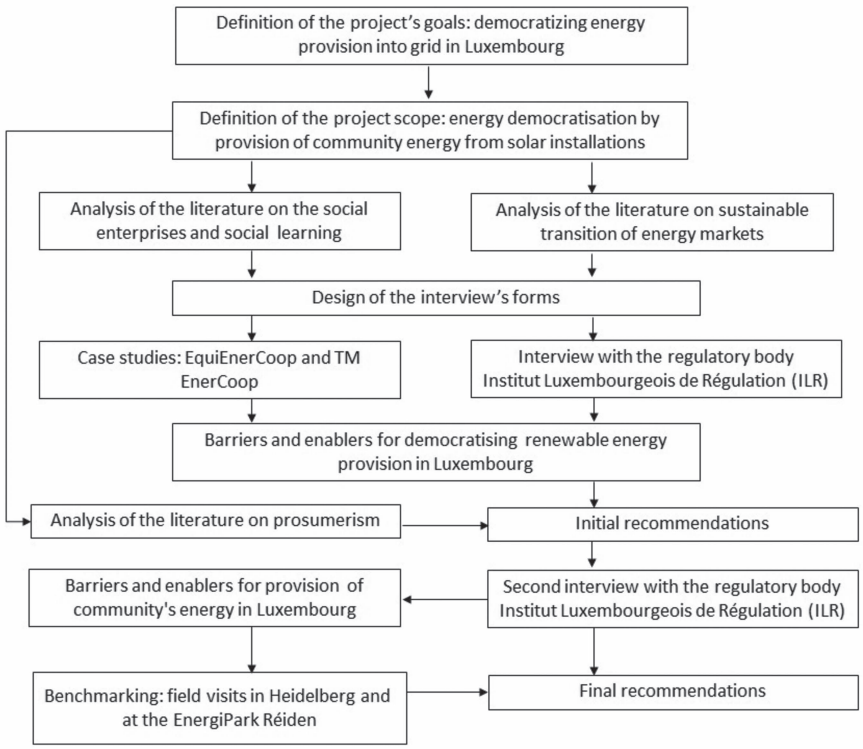

Figure 13.2 Peer group methodology

Insights: energy cooperatives as pioneers of social innovation in Luxembourg

In the towns of Esch-sur-Alzette and Junglinster, citizens, local policy makers and civil society organisations have come together to put into place a social business model that is innovative in the Luxembourgish context, with the aim of collectively producing renewable energy (Box 13.4).

Box 13.4 Facts and figures about EquiEnerCoop and TM EnerCoop

Common features of the cooperatives EquiEnerCoop (founded in 2012 in Junglinster) and TM EnerCoop (founded in 2013 in Esch-sur-Alzette):

- Objectives: social, environmental, political and, to a lesser degree, financial

- Membership: 85 to 150, mainly local, members co-owning PV installations
- Community context: emerging from pre-existing community activities and (transition) movements with local political support
- Business model: producing and selling solar energy from publicly owned roofs (125,000 kWh/year and 26,000 kWh/year, respectively) to energy suppliers at feed-in tariffs (FITs of 32 and 21 cents/kWh, respectively), based on volunteering and limited outsourcing of work
- Leadership: dedicated board members, combining multiple competences and investing significant amounts of time

Our case studies have shown that both of these energy cooperatives have been successful in establishing their entrepreneurial activities by "recruiting" a sufficient number of members from their communities (and beyond), mainly from the well-off middle class, willing to invest money in solar panels. They have also installed democratic and participatory governance structures (one member/one vote). Both have operated with low barriers of entry, with membership being tied to the minimum purchase of one share at the respective prices of 25 EUR (EquiEnerCoop) and 100 EUR (TM EnerCoop). Although their membership is mainly composed of local inhabitants, TM EnerCoop has also recruited non-profit organisations as members (such as Greenpeace) as well as people living outside their municipality.

Their main objectives have been to increase citizen and community involvement in renewable energy production, to increase environmental awareness, to help their municipalities reduce CO_2 emissions and to provide their members with a stable return on investment.

By seeking to replace energy from fossil fuels by renewable energy, the main motivation of the founders can be described as achieving "consistency", as defined by Schweizer-Ries and Samadi et al. (see Table 13.1).

Being pioneers, both cooperatives have had to innovate solutions and handle numerous problems relating to the technical installations (hardware, grid connection, fire protection), unexpected costs and financial management (grid connection fees, bank accounts) and administrative procedures (statutes, authorisation to use the roofs of public buildings, insurance issues, obtaining feed-in tariffs).

The key success factors for solving these issues have been the support and involvement of local policy makers, a competent and committed leadership and a sense of community and shared purpose among the members. Their ability to organise themselves, handle problems, launch their projects and mobilise significant resources within short time spans seems remarkable.

They are both economically viable, as they receive feed-in tariffs, guaranteed for 15 years, for selling electricity to energy suppliers. The feed-in tariffs are above electricity market prices (currently approximately 18 cents per kwh) and more than cover the costs of hardware and maintenance in the medium term. The cooperatives thus expect to break even after 11 to 12 years. Any profits are either returned to the members or re-invested in more joint projects serving the community.

To sum up, the cooperatives do indeed provide successful models for energy democratisation that are, in principle, transferable to other municipalities and

projects in Luxembourg. Indeed, new cooperatives are currently being founded in Luxembourg. And yet, they are still "niche experimenters".

Their growth prospects in the current setup are limited. Their main weakness is dependence on the time and competences of a handful of board members and, thus, their limited capacity to embark on new and larger projects. Moreover, their business model is under threat, as feed-in tariffs are expected to fall below market prices in the coming years. Therefore, for new projects and after the expiration of the feed-in tariffs for the current projects, a new business model will probably have to be developed that might also involve e.g. more outsourcing.

It could also be argued that they have not yet taken social entrepreneurship, decentralisation and democratisation as far as they might. Although the cooperatives have decentralised energy production, creating local revenue by putting energy in the hands of citizens, their business model still relies on selling electricity to big energy supplying companies and has not yet managed to reach other social strata of society.

The peer group therefore recommends that cooperatives like EquiEnerCoop and TM EnerCoop scale up their activities by extending them to selling energy directly to consumers and to their members (direct marketing) and to "turn prosumer" by embarking on projects based on collective "in-house" consumption of self-produced energy, including by tenants in apartment blocks. By so doing, the energy cooperatives would become more independent of energy companies (as main buyers of their energy), take local value creation and social inclusion another step further and move towards autonomous community energy management, thereby "revolutionising" the energy market. If coupled with strategies for greater sufficiency – here understood as changing consumption patterns and lifestyle (see Table 13.1) – the communities could not only reduce energy consumption, but would also achieve a better balance between energy supply (from self-production) and their own energy needs and demand (self-consumption). In this way, the cooperatives would move closer to self-sufficiency/autonomy.

Additional insights: collective prosumer projects and community grids

Prosumerism can be said to be the most democratic and decentralised form of energy provision and consumption. It is a model in which electricity is produced, owned, consumed and potentially sold and bought by the same person/entity or group of people located in the same building or in immediate geographic proximity, with no or very limited grid use for self-produced and self-consumed energy. The model dissolves the traditional separation between active energy producer and passive consumer and might well drive one of the major future trends on the energy market.

Advantages of prosumer models often cited are:

- Empowering consumers on the energy markets;
- Encouraging new, more efficient, energy consumption patterns (or "sufficiency" as defined in Table 13.1), because consumers become more aware of their energy use when shifting to producing and consuming their own energy;
- Balancing energy consumption in the grid (potentially reducing energy usage peaks);

Table 13.1 Comparison of motivations between the cases studies based on three different approaches to energy

Approach	*EquiEnerCoop*	*TM EnerCoop*	*Nussloch project*	*Heidelberg Village project*
Efficiency: Rational use of energy – using less energy to do the same job/achieve the same result [1]	✓	✓	✓✓	✓✓✓
Consistency: Consumption of energy from renewable sources in replacement of energy from fossil fuels	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Sufficiency: A change of social practice leading to a self-imposed restriction of energy consumption, independent of improved efficiency[2]	✓✓	✓✓✓	✓	✓✓✓

Source: (Schweizer-Ries, 2008 and Samadi et al., 2016)

[1]Typically based on technical improvements – more energy-efficient equipment and machinery, better heat insulation, etc.

[2]In general, arising from a conviction that this is the right thing to do. For many observers, the most obvious form of sufficiency may be in relation to the behaviour of domestic energy consumers, but the concept is equally valid for larger-scale consumers such as industries and transport systems.

Figure 13.3 Renewable energy cooperative in Heidelberg
Source: www.heidelberger-energiegenossenschaft.de

- Reducing costs, both with regard to energy costs and exposure to price increases on the part of the prosumer as well as for public energy infrastructure;
- A new approach for companies, cooperatives and other organisations to save costs and generate revenues.

The Renewables GSR, Ren 21, identifies "the use of solar PV for self-consumption in residential, commercial and industrial sectors" as one of the new emerging business models in Europe as a reaction to decreasing or inexistent feed-in tariffs (Ren, 2016, p. 61).

Although most prosumers in Europe, albeit still few in number, are private households, farms or single small or medium-sized businesses or institutions, wider systemic change in the energy market and beyond may be expected to emerge from the spreading of collective prosumer models for multi-family residential buildings, such as apartment blocks, and from largely self-sustaining energy communities.

The peer group went to Heidelberg in Germany to visit examples of collective prosumer models. There, a local energy cooperative (Heidelberger Energiegenossenschaft) has teamed up with a housing cooperative on a residential project, "Neue Heimat Nussloch", to install and operate rooftop solar panels, producing up to 370.000 kWh per year (broadly corresponding to the electricity consumption of about 100 households). Tenants have the opportunity of becoming clients, buying electricity from the cooperative below the market price with a 20-year price guarantee. This is possible because the cooperative does not have to pay certain taxes and fees.[4] Moreover, tenants can themselves become members of the cooperative and invest in solar installations. Surplus energy is fed into the grid (with feed-in tariffs); similarly, shortages are covered by grid supply. To realise the project, the cooperative had to install its own meters in the buildings and work closely with a (green) energy provider as well as the grid operator.

Another housing project, "Heidelberg Village", comprising 162 apartments, is currently being implemented by an architecture firm. As one core element, solar panels will be installed on the roof and facades. Any electricity not directly used will heat water or be stored in a battery. The firm is considering setting up a cooperative to facilitate direct marketing to the tenants as well as co-ownership. The energy

Figure 13.4 Designing built environment for sustainability communities: Heidelberg village
Source: www.heidelberg-village.de by Frey Architekten

installations are one element of a broader concept of sustainable and socially inclusive housing, which can be said to include attempts to change social (community) practices, including the energy consumption patterns of the inhabitants

Furthermore, the architects are currently working on a project to build a green district, with a Smart Green Tower at its core. Also having a solar panel façade, the tower (a residential and office building) will not only generate solar energy, but also supply it to neighbouring buildings and be connected to a large-capacity storage unit that will enable it to provide balanced loads to neighbouring districts through a smart grid.[5]

The project is thus based on the vision of local energy management, including the operation of a community grid designed for the collective sharing and storage of self-produced energy. Certain scholars and stakeholders believe that the setting up of grids suitable for a "two-way, new, decentralised energy landscape" (YEEPS, 2012, p. 9) constitutes one of the biggest public policy and technological challenges of our time.

As ambitious as they may be, these projects point towards the possibility of a future in which renewable energy installations are integral elements of all buildings (just like water pipes and electricity cables are today) and in which citizens and communities are the main agents in the energy market. Strategies for greater efficiency and consistency, as defined earlier, seem to be only the beginning of potentially deeper changes in the energy market. These would be brought about by altered individual and collective consumption patterns aiming for sufficiency and greater collective independence and self-determination via self-production, self-consumption and self-management of energy by communities. However, for this to happen, regulatory regimes require significant adaptation.

Policy recommendations and conclusion

In this section, we will briefly outline current EU policy developments, providing the framework for national policies, as a basis for formulating recommendations for policy makers and regulators in Luxembourg on how to promote citizens' energy and, more specifically, collective prosumerism.

In its Energy Union strategy, the European Commission encourages consumers to take "full ownership of the energy transition, to benefit from new technologies to reduce their bills and participate actively in the market, while ensuring protection for the vulnerable ones" (COM/2015/080). Moreover, in a communication on "delivering a new deal for energy consumers" it recognises that decentralised generation and storage options can "enable consumers to become their own suppliers and manager for (a part of) their energy needs" (COM/2015/339). In an accompanying document, it also describes best practices of "energy self-production".

However, although no official definition exists as yet, the examples given suggest that the European Commission has a rather narrow understanding of prosumerism, not including community prosumer structures. Partly for this reason, the European Economic and Social Committee has, since January 2015, published several studies and opinions. The EU consultative body argues for a broad definition of prosumerism, giving up a notion that presupposes the energy supplier and consumer necessarily to be the same entity, in order to allow tenants, for example, actively to participate in cooperative energy schemes. A definition should also cover community entities (cooperatives, local companies or authorities or similar) supplying "their electricity directly to consumers in the local area, without going via the energy market or distributors" (EESC, 2016, pp. 10–11).

During a public hearing organised by the EESC in June 2016, most stakeholders present agreed that the foundations for a prosumer revolution (i.e. an appropriate regulatory framework at national level dedicated to individual and collective prosumers' securing a level playing field, as well as incentives for self-consumption models) do not yet exist (Petrick, 2016, p. 10). As the EESC points out, there are currently "no signs of a consistently-implemented government strategy aimed at promoting civic energy", let alone community prosumer models (EESC, 2015, p. 2).

This situation, indeed, applies to Luxembourg. Although measures have been put in place to encourage energy cooperatives, important obstacles and barriers to further growth of citizens' energy in Luxembourg remain:

- Limitation of feed-in tariffs to utilities no larger than 200 kW;
- Limitation of cooperatives having to be set up by at least 10 "physical" persons (with a view to strengthening multi-stakeholder networks, it would make sense to allow non-profit organisations and public structures – for example, municipalities and local councils – to participate in the founding of cooperatives);
- Cooperatives cannot receive subsidies for major investments (whereas other legal entities can; however, a new law is currently under preparation);
- Non-transparent and sometimes high once-off grid connection fees (amounting to an unexpected 40,000 EUR in the case of EquiEnerCoop, for example);
- Little information or support provided by the national energy agency to support citizens with the administrative requirements of setting up or running a cooperative;
- No information provided by the national energy agency on prosumer energy installations, with or without battery storage;
- Grid operator CREOS opposes prosumer installations for small and medium-sized businesses and publicly owned buildings, citing a "lack of regulation".

With regard to prosumerism, there have been some improvements due to a new tariff methodology for settling grid fees initiated by the national regulating body (Institut Luxembourgeois de Régulation, ILR).[6] It clarifies that grid fees do not have to be paid on self-produced and self-consumed electricity. Self-consumed energy is also exempted from VAT and other fees, except from the 'taxe d'électricité'.

However, as of January 2017, prosumers will have to pay a "grid capacity charge". The exact amount, however (currently under negotiation), is likely to depend on factors such as the availability of a storage system (which would mean that prosumers will feed less or no surplus energy into the grid and take out less energy from the grid at times of peak consumption).

A grey zone remains regarding collective prosumer models, where solar panel owners and consumers are not identical (not the same legal entity). This would, for example, be the case when a cooperative (or other joint legal structure of the inhabitants) produces solar energy and supplies it to residents of the building on which the panels are installed (even if the residents are members of the cooperative). Under EU law, all consumers have the right freely to choose their supplier, to have grid access and to be invoiced based on their actual energy consumption. Therefore, in this case, there seem to be only three main solutions:

- The cooperative becomes an energy supplier, marketing the energy directly to the inhabitants (which would then be clients of the cooperative), with all

the legal, consumer protection and accounting obligations applying to energy suppliers in the market (Heidelberg case), or
- Self-consumption is limited to the collective parts of the building (staircase, etc.), or
- PV panels are divided up among the inhabitants, each household owning (or renting) a part of the solar installations and receiving its energy directly and exclusively from its own panels.

These options show how complicated and unclear the current legal situation is – and how little likely it is that collective prosumerism will become widespread under the current regime.

Another factor impeding the emergence of prosumerism in Luxembourg is the fact that there is currently no financial incentive for citizens to become prosumers, due to relatively low electricity prices and higher feed-in tariffs. Clearly, prosumer models only become economically interesting once it is cheaper to consume your own energy rather than to buy it from the grid. However, as mentioned earlier, this may indeed become the situation in a few years, when feed-in tariffs may fall below market prices.

Therefore, alas, there are currently neither single-household nor collective prosumers in Luxembourg according to official statistics.[7] The peer group has only heard of two potential collective prosumer projects that are currently being planned by two of the energy cooperatives (EquiEnerCoop and Energy Revolt).

For this reason, the peer group concluded that the three existing energy cooperatives in Luxembourg are still only "niche experimenters". A real field of citizens' energy, or "patchwork of regimes", has yet to emerge. Luxembourg – like all other European countries – still has a long way to go for a paradigm shift to take place in the energy market (and beyond), to move towards a decentralised and democratic energy transition.

A lot of advocacy work needs to be done by civic and public stakeholders to overcome lock-ins in the current system that continues to be dominated by (the interests of) large energy suppliers and monopolist grid operators that do not, currently, seem willing to become partners in paving the way for the transition.

In addition to adapting the regulatory framework, there are, however, some things that policy-makers can do:

- Introduce a self-consumption premium as a financial incentive for prosumerism;
- Provide subsidies for specific consultancy services, storage systems (e.g. batteries) or grid connections for small, medium and large-scale prosumer pilot projects;
- Require public authorities, property development and urban planning agencies to consider installing renewable energy devices for any larger housing projects and innovating solutions (including new business models) to enable residents, including tenants, to co-own installations and consume energy from their rooftops.

The potential for renewable energy production already exists in Luxembourg, but the challenge is to scale it up to a broader population and also targeting urban areas, where many people are tenants with varying socio-economic backgrounds.

In the view of the peer group, apartment blocks and large housing projects, in particular, offer considerable potential for developing collective energy production

and self-consumption, as demonstrated by projects in Germany and in other countries. So far, this potential is under-exploited in Luxembourg.

However, achieving transformational changes at the macro-level in Luxembourg may well depend on such projects, in addition to adequate financial incentives and a propitious regulatory framework.

We would like to conclude by stating our conviction that the future belongs to decentralised forms of energy production, consumption and storage, involving local communities, public authorities, housing owners, tenants and developers, architects, new businesses and cooperatives, to take the energy revolution forward.

Acknowledgements

We would like to thank Luis de Sousa (TM EnerCoop), Andreas Gissler (Heidelberger Energiegenossenschaft), Qiaozhi Meng and Juergen Heller (Frey Architekten) for the time they spent with us to explain their projects and provide feedback.

Questions for comprehension and reflection

1 Are you aware of any citizens' energy project or social enterprise in your region or country?

   - If so, how do they relate to the definitions given in this chapter?
   - If not, what might be preventing the development of such projects?

2 Could you consider becoming a prosumer yourself or teaming up with others in your neighbourhood, at your place of study or work to launch a prosumer project? If so, how would you proceed?

3 Imagine a future in which each building or district were to produce its own energy. How would things be different from today?

Notes

1 See Eurostat statistics on energy production and imports, http://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_production_and_imports
2 See www.equienercoop.lu (General Assembly on 1 June 2016) as well as www.freyarchitekten.com/pr/rising-stars-of-the-energy-union-energy-prosumers-in-europe/
3 Public hearing: "Rising Stars of the Energy Union? Energy Prosumers in Europe" organised by the European Economic and Social Committee on 28 June 2016, www.eesc.europa.eu/?i=portal.en.events-and-activities-rising-stars
4 On the self-produced electricity, the cooperative pays no grid fees and only the levy to finance the German energy transition ("EEG-Umlage").
5 www.freyarchitekten.com
6 See Règlement E16/12/ILR, 13 avril 2016: www.legilux.public.lu/leg/a/archives/2016/0091/index.html
7 See ILR statistics for 2015: www.ilr.public.lu/electricite/statistiques/releve_detaille_ilr/2015/Statistiques-imp-exp-prod-2015-01-10.pdf).

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