UNIVERSITÉ DU LUXEMBOURG

# Democratising renewable energy provision into the grid

**Authors**:

Paulina Golinska-Dawson
Kristina Hondrila
Simon Norcross
Aydeli Rios

**Mentors**:
Jules Muller
Luis de Sousa

Final version

08/04/2016

# Table of content

Executive summary ..... 4

1) Introduction ..... 8

1.1. Project Objectives and Methodology ..... 8

1.2. Social Innovation and the Energy Transition in Luxembourg: From Niche Experimentation to Systemic Change? ..... 9

1.2.1. Setting the Scene ..... 9

1.2.2. Conceptual Framework ..... 10

2) Democratising Energy Markets ..... 17

2.1. Energy democratisation: Power to the People ..... 17

2.2. Social Enterprises ..... 22

2.2.1. What are Social Enterprises? ..... 22

2.2.2. Funding Dimensions of Social Enterprises ..... 25

2.2.3. The Governance Structure ..... 26

2.2.4. Social Entrepreneurship and Social Entrepreneurs ..... 27

2.3. Cooperatives ..... 28

2.3.1. The Cooperative Model ..... 28

2.3.2. Advantages of the Cooperative Model ..... 30

2.3.3. Renewable Energy Cooperatives ..... 31

3) Legal & Policy Context of Renewable Energy Provision in Luxembourg ..... 32

3.1. European Legal and Policy Context ..... 32

3.1.1. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources ..... 32

3.1.2. Policy documents “Energy: New market design to pave the way for a new deal for consumers” ..... 32

3.2. Luxembourg Legal and Policy Context ..... 33

3.2.1. The National Renewable Energy Action Plan (NREAP) ..... 33

3.2.2. Règlement grand-ducal du 1er août 2014 relatif à la production d’électricité basée sur les sources d’énergie renouvelables ..... 34

3.2.3. Projet de règlement grand-ducal modifiant le règlement grand-ducal du 1er août 2014 relatif à la production d’électricité basée sur les sources d’énergie renouvelables ..... 34

3.2.4. Luxembourg Energy Market Policy - Barriers ..... 35
4) Case Studies ..... 36
4.1. Facts and Figures - Introduction ..... 36
4.2. Objectives ..... 40
4.3. Leadership and Members Organisation ..... 42
4.3.1. Leaders' Profile ..... 42
4.3.2. Membership & Organisation ..... 44
4.4. Plans and Factors for Growth ..... 45
4.5. Conclusions and Recommendations based on the Case Studies ..... 46
4.5.1. Micro-level: Energy cooperatives as "niche experimenters" in renewable energy production and ownership ..... 46
4.5.2. Meso-level: How to scale-up energy democratisation and renewable energy production? ..... 49
5) Prosumerism as an Alternative (Business) Model ..... 53
5.1. Prosumers and their Role in Democratising Energy Markets ..... 53
5.1.1. Challenges for the Development of Prosumerism in Luxembourg ..... 55
5.1.2 Benchmarking - Prosumerism Examples from Germany ..... 59
5.1.3 Policy Recommendations concerning Prosumerism ..... 60
5.2. Proposing a New Energy Cooperative: OurEnerCoop ..... 61
5.2.1. Main Aspects of the "Prototype" ..... 61
6) Bibliography ..... 65

## Executive summary

Renewable energy has become a cornerstone in strategies for sustainable development, as a substitute for fossil fuels, and thus a pre-condition for the transition into a low-carbon era. Under the EU2020 policy framework, Luxembourg has committed to increase the share of electricity generated from renewable energy sources from the current 3 % to 11 % by 2020. This is an ambitious pledge and in order to reach it a social and technological transition is needed. A potential key factor in the success of this transition would be the democratisation of the provision of energy into the Luxembourg grid.

We approached the topic from the perspective of social innovation, describing how developments in the energy sector can lead to wider systemic transformation. In this light, we investigated the specific role that social enterprises, and RE cooperatives in particular, can play in this democratisation process and how their activities can become drivers of change at a transformative scale. However the scope of this project did not extend to speculation about whether and how Luxembourg may succeed in this transition.

As a starting point of our report we analyse and compare two renewable energy (RE) cooperatives: EquiEnerCoop in Junglinster and TM EnerCoop in Esch-sur-Alzette, identifying their strengths and weaknesses. Both cooperatives produce solar energy.

The case studies demonstrate that both EquiEnerCoop and TM EnerCoop are attaining their environmental and financial objectives - generating and selling renewable energy and financing their investments and activities by “recruiting” from their communities (and, in the case of TM EnerCoop, beyond) enough members willing to invest a sufficient amount of money. Both have implemented a social business model that is innovative in the Luxembourg context and is economically viable under the existing regime of guaranteed feed-in tariffs (FITs). Any profits are (or will be) either returned to the membership or re-invested in more joint projects serving the community. Both have adopted organisational structures that guarantee democratic member participation and shared ownership. Thus, in Esch and Junglinster, diverse groups of stakeholders and citizens have found new ways of working together and have put in place innovative models for collective renewable energy generation.

The key success factors for these cooperatives have been favourable framework conditions (public policy), a competent, committed and trustworthy leadership and a sense of community and shared purpose among their members. Their ability to organise themselves, handle problems, launch their projects and mobilise significant resources within a short time is remarkable. The cooperatives thus demonstrate how local communities can be fruitful grounds for innovative shared solutions to complex sustainable development issues.

In this sense, the cooperatives indeed provide successful models for energy democratisation that are, in principle, transferable to other municipalities and projects. Policy-makers in Luxembourg seem genuinely interested in supporting this model. At the same time, it would make sense to allow

non-profit organisations and public structures to participate in the founding of cooperatives, thereby widening the target group and opening the field further.

Both cooperatives generate electricity using solar panels (photovoltaic, or PV, panels). The decreasing investment cost, easy availability and relatively simple and quick installation of PV panels are important considerations in favour of choosing them as a means of renewable energy production, particularly for small and medium-size projects, to which this technology is very well suited. Other current technologies do not offer this combination of advantages. For these reasons we have considered it appropriate to focus on PV as the technology of choice in this report.

Formulating recommendations for the energy cooperatives, we nevertheless conclude that they need to consider scaling up their activities and adapting to future realities, in order to continue to offer a viable model. There are three reasons for this:

- FITs and planning security: Their guaranteed FITs will expire from 2027, whilst the life expectancy of the existing PV installations is about ten years longer
- Professionalisation/formalisation: Relying exclusively on volunteers limits capacity for future projects
- Local added value and democratisation: Although challenging the historical structure of the energy market in Luxembourg, the cooperatives remain dependent on established energy suppliers to buy their electricity via a grid that, at least in the case of the Junglinster area, is operated by a quasi-monopolist

Based on the conclusions from the case studies, we outline possible alternative models, investigating the emerging EU prosumerism ("prosumer" being a contraction of "producer" and "consumer") policy framework and making policy recommendations.

We thus recommend taking democratisation another step further by extending it to self-consumption (prosumerism) and self-management of renewable energy:

- Localising not only the production, but also the consumption of energy, and
- Managing the energy produced by the local communities themselves.

Prosumerism is a model in which electricity is produced, owned, consumed and potentially sold and bought by the same group of people. The prosumerism model that we recommend could be an extension of the existing projects of the cooperatives and could potentially open up new business opportunities.

Accordingly, EquiEnerCoop and TM EnerCoop could scale up their activities by extending them to the local management and consumption of the renewable energy they produce. By selling their energy directly to their members or communities, they would turn into collective prosumer units. Local value creation would thereby be increased and the communities would move another step towards energy autonomy. Studies also suggest that prosumerism has a stronger effect on reducing energy consumption and changing consumption patterns.

In our judgement prosumerism therefore offers the best way forward. In fact, prosumerism could be considered the ultimate objective and consequence of "energy democratisation", being in line with the following principles:

- Independence from fossil fuels,
- Independence from major commercial interests and market player diversity,
- Prices, transparency and consumer protection,
- Acceptance of renewable energy utilities by citizens and participatory planning,
- Renewable energy sources as "common goods",
- Decentralisation and regional value creation,
- Financial participation in and co-ownership of renewable energy utilities by citizens.

In this respect we expect prosumerism, as advocated by major political instances such as the European Commission, to play a major role in future.

However, Luxembourg's legislative and policy context is not currently very propitious for the development of the prosumer paradigm. We therefore propose to seek to influence government policy in the following areas:

- Investment in and ensuring a favourable legislative framework for a grid infrastructure adapted to widespread decentralised electricity generation.
- Prosumers should only be required to pay grid fees (paying the grid operator for the infrastructure that delivers electricity) for power received through the grid, not for that power that they generate and use themselves.
- Administrative procedures for becoming a prosumer should be simplified to the maximum.
- It should be possible for small local power generators to take over the operation of the grid in their locality.
- Financial incentives should be considered, e.g. subsidising the cost of specific energy consultancy, batteries, grid connections, large-scale renewable energy installations on and for apartment blocks built as prosumer units etc.
- Ways should be found for tenants to benefit from prosumer infrastructure, not just the owners of apartments.
- Real estate agencies, property-development agencies, construction companies, urban planning agencies, communes etc. building apartment blocks (of a certain size) and new urban districts should be incentivised and required by law to consider installing renewable energy generation devices and building their projects as "prosumer" units

Concerning the last point, we recommend incentive schemes for the installation of solar panels or other renewable energy equipment for any medium- or large-scale housing and urban development project in Luxembourg. Building construction should include the production and self-consumption of renewable energy as standard, making them prosumer units by design. Renewable energy generation systems would become part of the building infrastructure - like for example water pipes are today.

Apartment blocks, in particular, offer considerable potential for developing collective energy production and self-consumption, as demonstrated by projects in Germany and in other countries. These solutions involve tenants in apartment blocks, not just owners, so they reach many more citizens from diverse socio-economic backgrounds. Moreover, the “barriers to entry” to producing and using renewable energy are lowered considerably.

We conclude that achieving transformational changes at the macro-level in Luxembourg may well depend on such projects as well as the availability of suitable financial incentives.

Furthermore, many other initiatives, measures and (business) models are needed, if Luxembourg is to reach a renewable energy share of 11 % by 2020 and for the democratisation process to pick up speed.

Based on our case studies and the reflections outlined above, we furthermore developed a “prototype” for a new energy cooperative, OurEnerCoop, which has made prosumerism its key objective, implementing it both in its own community as well as in apartment blocks.

We thus propose to establish a new social enterprise, with private individuals, local government, NGOs and, possibly, small local companies as members, with little or no geographical limitation. The key activities of OurEnerCoop would include:

- Based on solar power generation, selling and distributing the electricity generated to its members in the immediate locality (in the same or neighbouring buildings), reducing their electricity bills, because no grid fees would have to be paid on “home-grown” energy (in contrast to any additional electricity that may have to be provided through the grid). Any surplus electricity would be sold to the existing energy supplier, probably at market rates.
- Testing the basic prosumerism approach for apartment blocks through a pilot project. This would involve installing an appropriately scaled PV array on a new medium-sized apartment block and inviting the families concerned to join the cooperative as members and clients in return for cheaper electricity bills.
- If the pilot is successful, entering partnerships with property developers interested in building prosumer infrastructure into new apartment buildings from the start.

With a view to financial self-sustainability, OurEnerCoop should also seek to sell consultancy on collective renewable energy provision and consumption solutions to commercial entities. The speed with which this model can be adopted depends on the future cost trends of PV modules and, perhaps even more, of battery storage devices. On the basis of experience the adoption of a more commercial organisational structure might later be considered, for example for the provision of consultancy services.

# 1) Introduction

## 1.1. Project Objectives and Methodology

The aim of the project is to investigate the topic "Democratising renewable energy provision into the grid" in Luxembourg. As a starting point we chose to analyse and compare two cooperatives that produce solar energy: EquiEnerCoop in Junglinster and TM EnerCoop in Esch-sur-Alzette.

We used the case-study approach, which is particularly suitable for understanding "how" or "why" social phenomena work (Yin, 2013). It is particularly called for when an "in-depth" description of social phenomena is required.

Based on these case studies, we derive recommendations both for the business model of a new energy cooperative and for policy-makers to make the regulatory framework more favourable for the democratisation of renewable energy generation in Luxembourg.

We approach the topic from the perspective of social innovation, relating it to the question of how transformations in the energy sector can result in wider systemic change. In this regard, we investigate the special role that energy cooperatives and social enterprises have in the process of democratisation and how their activities can become drivers of change at a transformative scale.

Last but not least, we therefore relate current developments and initiatives to the vision and efforts of certain scholars and policy-makers who seek to prepare Luxembourg for the „Third Industrial Revolution", ensuring its transition into a sustainable future. As will be described, the concept of prosumerism (sometimes also called self-consumption) has a key role in this regard and will be a key element of the alternative business model we will propose.

The structure of our project report is as follows:

1. Relating theories of social change to our project (Introduction / chapter 1)
2. Characterising the democratic and social (business) features of energy cooperatives using concepts on democratisation and social entrepreneurship (chapter 2)
3. Describing the current legal and policy framework (chapter 3),
4. Analysing strengths and weaknesses of two energy cooperatives in Luxembourg and making recommendations for the cooperatives as well as for policy-makers (chapter 4),
5. Developing alternative models and policy recommendations based on prosumerism and solar energy (chapter 5)

As a point of entry into the subject matter, a basis for the case studies and in order to gain a better understanding of the perspectives of the actors involved, we have conducted four qualitative interviews with:

- Jules Muller, President and founding-member of EquiEnerCoop
- Luis de Sousa, board member of TM EnerCoop

- Claude Hornick, Chef de service Energie / Directeur, and Christian Meyers, Service Energie, in charge of the compensation fund, at the ILR- Institut Luxembourgeois de Régulation)
- Paul Zeimet, Secrétaire Général at the Société Electrique de L'Our SA (SEO)

In addition, we have also had the opportunity to speak with Simone Polfer, another founding member of EquiEnerCoop and civil servant in charge of state aid at the Luxembourg Economy Ministry. Thanks to our mentor Jules Muller, we also conducted an on-site visit of the PV installations of EquiEnerCoop in Gonderange. He opened many doors and new perspectives, giving us many excellent hints and very useful literature.

Regarding bibliographic references, a special appreciation to Benjamin Huybrechts and Sybille Mertens from the Centre for Social Economy, HEC Management School, University of Liege, Belgium, who kindly shared their research titled "The relevance of the cooperative model in the field of renewable energy", published in the Annals of Public and Cooperative Economics (2014).

We warmly thank everyone for their invaluable contributions and insights.

## 1.2. Social Innovation and the Energy Transition in Luxembourg: From Niche Experimentation to Systemic Change?

*What we do is actually a change of paradigm.*

Simone Polfer, founding member of EquiEnerCoop, on 8 December 2015

### 1.2.1. Setting the Scene

There is broad consensus about the challenges facing the industrialised world and global community. Climate change, the depletion of natural resources (e.g. fossil fuels), decreasing biodiversity, waste and pollution figure prominently among the environmental challenges that have been identified as threats to the very survival of our societies, economic systems and planet. Renewable energy has become a cornerstone in strategies for sustainable development, as a substitute for fossil fuels and, therefore, a pre-condition for the transition into a low-carbon era.

Under the EU2020 policy framework, Luxembourg has committed to increase the share of electricity generated from renewable energy sources from the current 3 % to 11 % by 2020, other EU countries having made similar - or in many cases even more - ambitious pledges. Recently, the government has hired the US sociologist Jeremy Rifkin as a consultant to make Luxembourg a "living lab for sustainable solutions" preparing it for what he calls the "Third Industrial Revolution" (Luxemburger Wort, 25.9.2015).

Hence, when looking at energy cooperatives, it seems relevant to ask under which conditions and in which way they could become drivers of and contributors to a sustainable transition in Luxembourg. Therefore, the point of departure of this project is to look at the potential role that local initiatives can play in the complex dynamics of social innovation.

This report focuses mainly on photovoltaic technology (solar panels, or PV), as a means of renewable energy generation. The existing PV technology has shown itself to be easily accessible and relatively

affordable; as such it is very well suited to local energy generation projects. It offers the potential to be scaled up as an important contribution towards a sustainable transition in Luxembourg, strengthening the reliability of energy and social responsibility in the community.

### 1.2.2. Conceptual Framework

According to the European Commission, social innovation can be defined as "the development and implementation of new ideas (products, services and models) to meet social needs and create new social relationships or collaborations […] Social innovations are innovations that are social in both their ends and their means" (EC, 2013, p. 6).

Social innovation describes an entire process "by which new responses to social needs are developed in order to deliver better social outcomes" (idem).

In fact, social innovation lends itself to a multi-level perspective, if considering it as a pre-condition of systemic change, starting at isolated innovative initiatives at local level, spreading to society as a whole and, finally, acquiring transformative scale, if coinciding with and reinforced by other developments.

To illustrate this point, we have adapted the different levels of the Dutch theory of socio-technical transition to the energy sector and wider societal context of Luxembourg (see figure 1 below):

1. **Micro-level:** energy cooperatives and other local and social initiatives (niches)
2. **Meso-level:** spreading of initiatives resulting in wider changes in energy regimes and throughout society (patchwork of regimes)
3. **Macro-level:** paradigm-shift penetrating the entire fabric and "landscape" of society as a whole, marking the transition to a new era - "The Third Industrial Revolution" being a good example

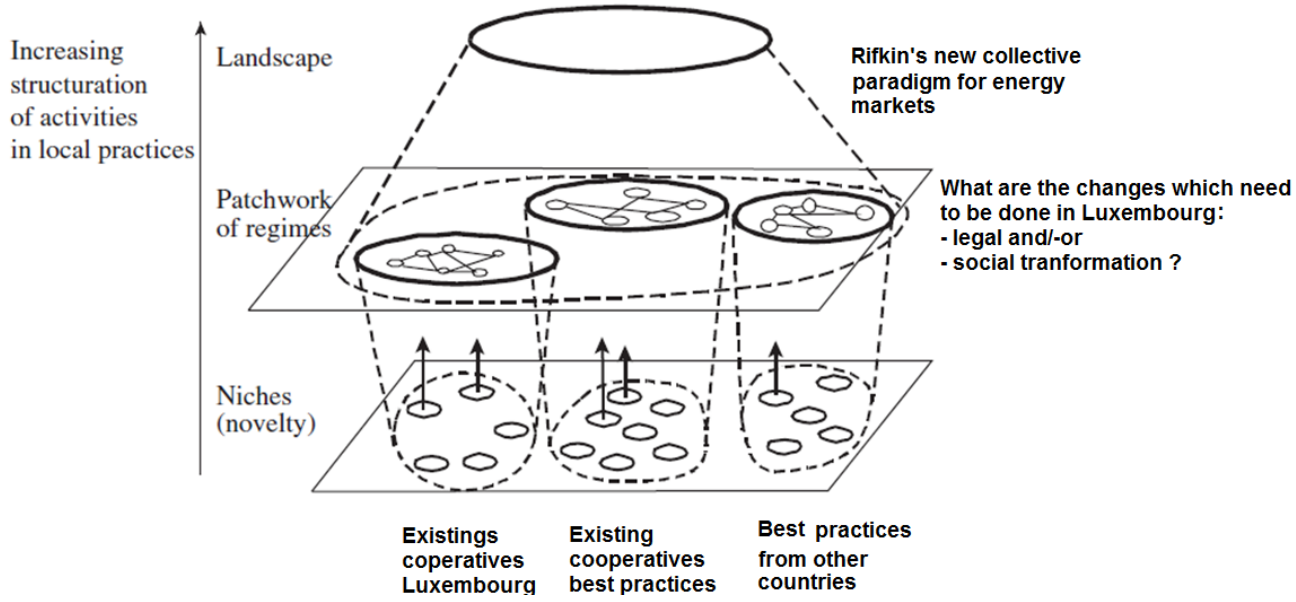


Figure 1: The social-technical transition model for provision of the renewable energy in Luxembourg, elaborated based on (Geels, 2002)

### *a) The micro-level: Energy cooperatives as pioneers of social innovation*

The organisational forms or vehicles, by which social innovation can be promoted, are multiple. Generally, it is organisations within the **social economy, or third sector** between the private (business) and public (government) sectors that are considered to hold a particularly large innovative potential. The social sector is composed of structures such as non-governmental organisations, charities, neighbourhood associations – as well as social enterprises and cooperatives. They can also be defined as "normative organisation" (Mulgan, 2006, p.75), given the fact that they tend to be based on shared values and endowed with a common sense of purpose.

In the following, we describe different categories and perspectives that can be applied to energy cooperatives, depending on which aspects of their structures and functioning one seeks to analyse and highlight.

**Energy cooperatives as social enterprises**

One way of looking at energy cooperatives is to consider them as social enterprises.

Social enterprises are deemed to have a special role to play in social innovation, due to their "social mission" and the fact that "the value they create is necessarily shared value, at once economic and social" (EC, 2013, p.7). According to this view, social enterprises, even if "small in numbers (marginal or niche), nevertheless hold valuable insights and intelligence regarding social innovation for Europe" (EC, 2013, p.16).

Or, as Geoff Mulgan puts it, "social entrepreneurship sits within a broader context of social change" (Mulgan, 2006, p.75). He emphasises that social change often "draws on the often invisible fecundity of tens of thousands of individuals and small groups who spot needs and innovate solutions" (Mulgan, 2006, p.76).

In sub-chapter 2.3. we shall elaborate on the notion of energy cooperatives as social enterprises.

**Energy cooperatives as multi-actor innovation networks for sustainable and regional development – the social learning perspective**

Another way of looking at energy cooperatives is as multi-actor innovation networks addressing sustainability in local and regional development contexts (Sol et al., 2012, p.35).

In fact, many scholars attribute a privileged status or "specific capacity" to the local and regional levels in developing new and innovative sustainable solutions and approaches, "because this is the level at which ecological processes and human activities most intensely interact" (Sol et al., 2012, p.35).

The local level provides a particularly fertile ground for the establishment of multi-actor innovation networks, in which various groups and stakeholders (public and private organisations, citizens, local communities and initiatives, such as cooperatives) come together:

> Sustainability problems are best addressed when multiple actors with diverse interests and perspectives develop a shared frame on a jointly perceived problem or challenge, which enables joint action (Sol et al., 2012, p.35).

Given the diversity of actors involved, these networks can only work if the actors adapt themselves to each other and find common denominators. This process can be analysed as a process of **social learning,** which can result in changes in both perception and behaviour in the individual actor as well as the entire group (Sol et al., 2012, p.37).

In this regard, Sol, Beers and Wals (2012, p. 37) have defined the role of **trust** (expectation that others will act in mutual interest)**, commitment** (level of interests, emotions and resources invested by the participants) **and (re-)framing** (emergence of a common understanding of problems and solutions) as particularly important.

Based on these concepts, our two case studies can be considered as examples of local multi-actor innovation networks engaged in collective and interactive learning processes. We therefore set out to analyse the **motivations and attitudes, interests, resources, values** and **interaction** of the actors involved (chapter 4).

**Energy cooperatives as cooperative partnerships**

Finally, the organisational form, the main principles of functioning, organisational processes and dynamics of cooperatives, including their democratic character, can be analysed as a particular form of partnership, characterised by reciprocity and voluntary commitment. These aspects will be highlighted in chapter 2.3.

In this perspective, cooperation and organisational theories seem particularly useful. According to the cooperation theory developed by Messner, Guarin and Haun (2013), the main inter-related factors for cooperative behaviour and, therefore, successful cooperation are (Messner et al., 2013, pages 15-22):

1. **Trust** understood as the expectation that the involved actors will act in each other's interest
2. **Communication** as a pre-condition for cooperation and trust-building
3. **Reputation** of the actors involved as trustworthy (particularly important in the start-up phase of establishing a partnership)
4. **Fairness** understood as equality among the actors and agreement on the rules applying to everyone
5. **Enforcement** taking place when common rules are not obeyed or violated (sanctions)
6. **We-identity**: sense of community and belonging-together

Applying this theory, social learning can also be considered as a dynamic and collective process of finding ways to strengthen and leverage these factors to maximise the positive outcomes of the cooperation or, simply, "learning how to cooperate".

Furthermore, it seems interesting to look at different stages that cooperative partnerships undergo (based on van der Molen & Ietswaart, 2012):

1. **Start-up phase**: initiation of cooperation, developing common ideas and common purpose ("mission"), mobilisation of (future) members, setting up appropriate organisational structure and decision-making processes (e.g. legal form) and raising the necessary resources
2. **Implementation and consolidation**: carrying out the activities agreed upon
3. **Further development** (or reframing) of mission, activities, organisational structure, membership and networks, resources etc.

These phases will be highlighted in the case studies (chapter 4).

### *b) The meso-level: Transforming the energy sector*

In fact, "further development" is crucial when adopting a social innovation perspective, as it concerns the question of "scalability":

1. How can cooperative partnerships leverage and expand their activities?
2. How can policy-makers contribute to local initiatives not only multiplying, but also resulting in wider transformations?

These questions are addressed at the meso-level.

**Organisational strategies for spreading innovation and increasing impact**

One of the core activities of organisations in the third sector is to build informal, peer-to-peer networks. As pointed out by Mulgan, social entrepreneurs – and, one might add, actors in the third sector in general – "often achieve their impact by mobilising networks more effectively than public and for-profit organisations", engaging with politics, public opinion, and funding flows (Mulgan, 2006, p.92-93).

When addressing the "scalability" of innovative practices, the ability to build networks becomes decisive. As Jeffrey Bradach and Abe Grindle point out, "norms and practices are shaped in a community and therefore, certain types of changes must be scaled through the community" (Bradach & Grindle, 2014, p.7). They suggest the following strategies to further develop social enterprises and for them to promote social innovation to reach a truly "transformative scale" is presented in figure 2.

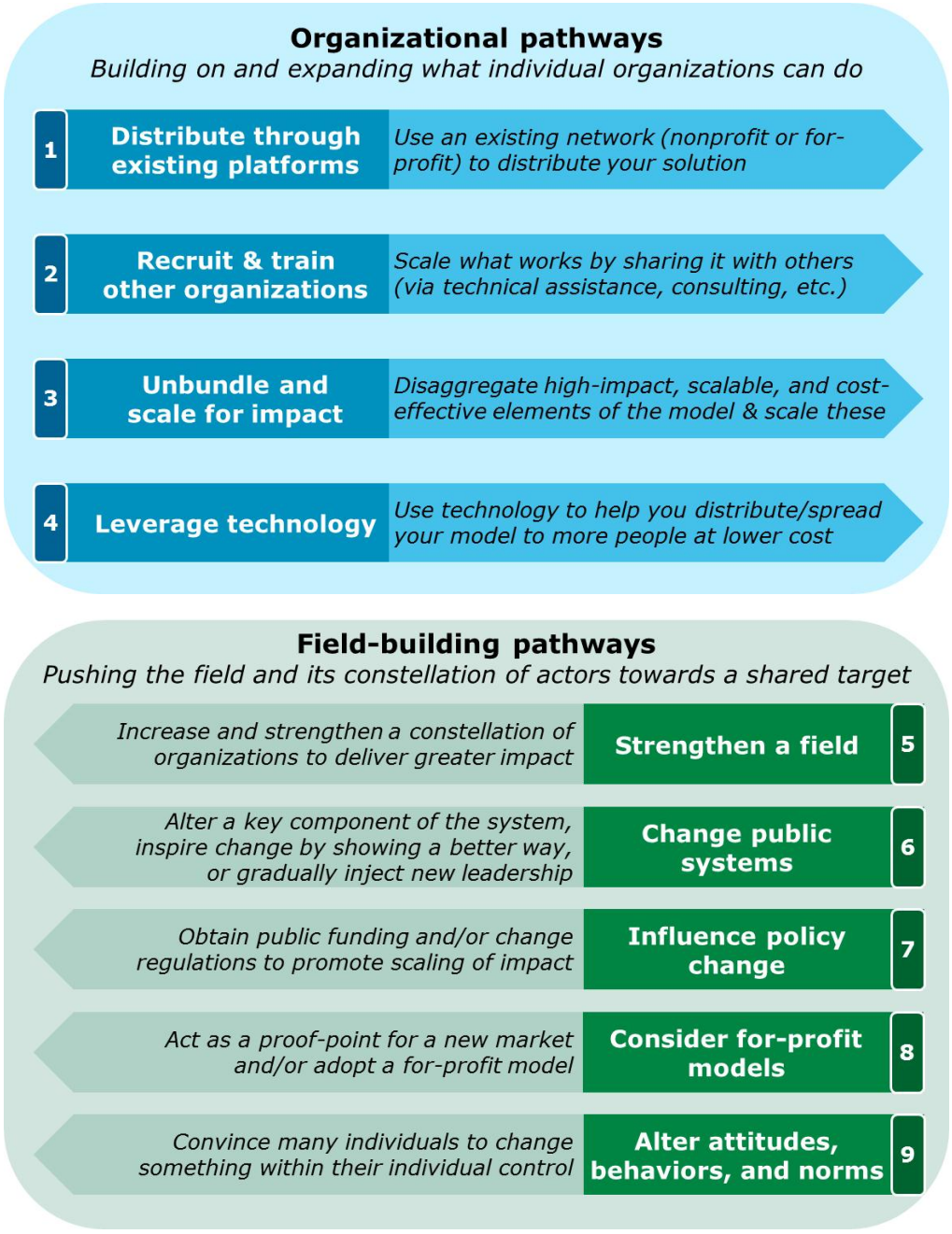


Figure 2: Strategies to reach transformative scale (Bradach & Grindle, 2014, p. 2)

Strategies 6 and 7, “Change public systems” and “Influence policy change” and, thereby, the role of governance and its inter-play with the third sector, seem particularly relevant as regards the question of democratising renewable energy production in Luxembourg.

**Governance: the importance of enabling regulatory frameworks**

A pre-condition for scaling is that policy frameworks are adapted and reformed to provide favourable conditions for social innovation and participatory processes, which is also why advocacy (or “lobbying”) is an important activity of innovative organisations.

Mulgan sees social entrepreneurship as part of "the much broader story of democratisation: of how people have begun to take control over their own lives, over the economy, and over society" (Mulgan, 2006, p.94). As a consequence, he emphasises that social entrepreneurship thrives best in conditions of "democracy, rights, and freedoms" (Mulgan, 2006, p.94).

One major objective of policy-makers should be to remove as many barriers as possible to social entrepreneurship and create a more flexible legal environment, while also facilitating access to finance and supporting capacity-building (Mulgan, 2006, p.82-84).

Policy-makers are confronted with the challenge to identify which ideas are the most promising in terms of outcomes and impact (EC, 2013, p.9). One method, promoted by the European Commission to "test" specific types of innovation and small-scale projects before adopting them more widely is "social policy experimentation". Social policy experiments are defined as "policy interventions bringing innovative answers to social needs" to be "repeated on a wider scale if the results prove convincing" (EC, 2013, p.19).

Another method could be to support "demonstration projects" that have the potential of being turned into a "national standard" (Bradach & Grindle, 2014, p.6).

Under this definition, the programme of the government of Luxembourg to promote and provide financial incentives for the creation of energy cooperatives by citizens can be understood as a "social policy experiment" aiming at up-scaling citizens´ participation in renewable energy generation and, thereby, supporting democratisation and decentralisation in the energy sector as a whole.

### *c) The macro-level: Systemic change towards the 3rd industrial revolution?*

Systemic change is neither something that can reliably be predicted, nor does it happen overnight. And yet, if the above described initiatives, dynamics and measures are allowed to unfold their impact and are coupled with a series of other initiatives and measures, the chances are that we (or our children and grand-children) will see systemic change happening. What seems to be at stake is nothing less than the question of if and how Luxembourg, together with the other industrial countries, will succeed in the transition towards a sustainable future.

**The role of energy**

Many scholars believe that the "energy transition", far from being an isolated process, will have far-reaching implications for all spheres of our societies (politics, economics, culture, technology, etc.). In other words, a deep transformation of the way we produce and consume energy would inevitably herald a new era. Jeremy Rifkin, chief advisor of the Luxembourg government since 2015, famously coined the term "Third Industrial Revolution" (TIR). What makes these scholars go so far in their assumptions?

First of all, they consider energy "an inherent, intrinsic aspect of social change", going as far as calling it the '"glue that holds together different elements of the social order but also as a force that helps to transform them […]" (Gross & Mautz, 2015, p.9). In fact, they point out the "sociological importance of analysing energy utilisation as a crucial element in understanding social development

because without this part of the puzzle no society or political system can adequately be understood" (Gross & Mautz, 2015, p.31).

Thus establishing a close connection between energy sources and the socioeconomic development of societies, they point out that the 1st industrial revolution was literally powered by fossil fuel, which, in turn, has been in the hands of centralised big players. The industrial and fossil fuel age was "characterised by gigantism and centralisation", due to the fact that fossil fuels require large amounts of capital and favour vertical economies of scale, necessitating a "top-down command and control structure" (Rifkin, 2011, p.114).

Now, with climate change and the depletion of fossil and natural resources looming on the horizon, they believe that the industrialised world is confronted with the "next great experiment", consisting in the transition to renewable energy resources, requiring not just technological change but also sociocultural transformation. The process of transformation will range from everyday practices and niche experimentation to large-scale economic and political processes (Gross & Mautz, 2015, p.5).

Transformations in the energy sector will entail deep change because decentralised modes of energy production will give rise to "fundamental shifts in social organisation that affect all areas of people´s lives" (Gross & Mautz, 2015, p.8).

**The Third Industrial Revolution?**

One of the most prominent figures heralding the beginning of a new era is the above-mentioned Jeremy Rifkin. According to him, changes in energy regimes, combined with new digital communication technologies, will result in a powerful new infrastructure that will form the backbone of the Third Industrial Revolution and a new collaborative age:

> 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", just like we now create and share information online. 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)

In the second part of our century distributed business practices and lateral – rather than traditional, hierarchical – power, particularly, peer-to-peer relations, will dominate society. The third sector, so he believes, will become the dominant sector of society, in which most people will find work. Most people will be prosumers, installing solar panels on their roofs to generate and be able to consume their own electricity, with surpluses or shortages of electricity being sold or bought respectively via an "intergrid". This "would democratise the production and distribution of energy by creating millions of mini energy entrepreneurs" (Rifkin, 2011, p.48), leading to a new Collaborative Age

Finding efficient and powerful storage systems (e.g. hydrogen) as well as the setting up of intelligent utility networks and smart grids will be key to making his vision come true. The teaming up of the construction industry and the real estate sector, in order to turn all buildings into micro-power plants, will be another important pillar (Rifkin, 2011, p.45).

Calling the process a "community exercise", he emphasises that "without a broad consensus on goals and objectives, it is unlikely that any political jurisdiction will have sufficient social capital to rally its citizenry for such fundamental structural change" (Rifkin, 2011, p.103). Furthermore, "only an open, transparent, and comprehensive partnership between business, government and civil society will provide the traction to make the transition possible" (Rifkin, 2011, p.131). Such partnerships need to emerge at every level (local, regional, national, continental, global). Therefore, the TIR will also change "the way we think about politics" (Rifkin, 2011, p.138).

Luxembourg, along with most other countries in the world, is still a far cry from Rifkin´s vision. The process that is meant to prepare Luxembourg for the transition is only about to begin, with an official launch and first information session having taken place on 21 January 2016. It remains to be seen what results the process will bring.

It is not however the concern of this project to venture into the speculative field of predicting whether and how Luxembourg will succeed in the transition.

Instead, we shall try better to understand the possibilities and constraints of two existing energy cooperatives and outline related concepts and possible paths forward. And in this respect, prosumerism, as advocated not only by Rifkin but also by major political instances such as the European Commission, will play a certain role in the report.

## 2) Democratising Energy Markets

### 2.1. Energy democratisation: Power to the People

In this sub-chapter, we outline concepts on what can be understood by "democratising" renewable energy provision.

However, first of all, we need to look at why the "energy transition" calls for reflections about the role of citizens and how to increase their participation. The Federation of Groups and Cooperatives of Citizens for Renewable Energy in Europe (REScoop) makes it sound self-evident:

> "It is clear that involving citizens is the only way to make the energy transition succeed. This means we must move from a centralised, oligopolistic energy system to one that is decentralised and above all democratically controlled and operated" (REScoop, 2015, p.69)

Why is that? First of all, a major element of the energy transition is reducing energy consumption. Changing consumer behaviour and awareness is a *sine qua non* condition in this regard. Another reason, very simply, is that not only are renewable energy sources such as wind, sun or biomass - unlike fossil fuels - in principle, available everywhere, they are also most efficiently exploited locally. Any transmission means energy loss. Finally, when looking at the dominant renewable energy sources, onshore wind and photovoltaic energy are the ones that require the least investment, and installation costs continue to decrease (COM/2015/080, European Commission, p.15). They are, therefore, the most accessible means of electricity generation for citizens (biomass is mostly used by farmers to produce heat and is not dealt with in this project).

The following main aspects of energy democracy or democratisation can be identified in the literature and debates:

**Independence from fossil fuel-exporting countries and sustainability**

Besides combatting climate change, one of the main objectives of replacing fossil fuels by renewable energies is the worrying high degree of energy dependence that European countries have on imports of oil, natural gas and coal from totalitarian regimes and non-democratic countries such as Russia (oil, natural gas, coal), Saudi-Arabia (oil), United Arab Emirates (oil) and Iraq (oil). Clearly, from both an economic as well as from a (foreign) policy point of view, it makes a lot of sense to significantly increase the share of energy sources that can be (democratically) controlled regionally and nationally within Europe.

Moreover, renewable energies being omnipresent and sustainable (i.e. inexhaustible and non-polluting), they provide a sound basis for the long-term existence of our democracies and market-economies.

The fact of being safe and clean also distinguishes renewable energies from nuclear energy, which not only entails security and safety risks, but also poses a major waste disposal challenge (in terms of long-term safety, financial costs and public acceptance) for many more generations to come.

**Independence from "Big Business" and diversity**

As implied by the term "transition", the democratisation of energy means moving away from an existing system – one dominated by a few large profit-oriented corporate energy suppliers - towards a market characterised by a diversity and increasing heterogeneity of actors. The often quasi-monopolistic structures give way to a truly diverse market, in which many small players dynamically unfold their activities and assume their rightful place.

Ultimately, the ideal of independence turns into the goal of autonomy from any external suppliers, that is, self-sufficient prosumerism at individual or community-level.

**Prices, transparency and consumer protection**

Many consumers and consumer organisations have frequently criticised the untransparent pricing structures of the large energy suppliers, which to many seem more interested in maximising profits than in, for instance, letting consumers benefit from decreasing fossil fuel prices. In some countries (e.g. Germany), there has been political debate around the socio-economic consequences (increased poverty or risk of poverty) of energy prices that not everyone can afford. Seen from the consumer perspective, transparency, affordability and consumer protection may therefore be highlighted as elements of "democratisation".

**Renewable energy sources as "common goods"**

Many grass-root movements and federations such as REScoop point out that renewable energy sources (wind, solar, hydro, biomass and geothermal energy) belong to no one and should therefore be available to all. They are "common goods":

> "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).

The argumentation also implies the notion that access to energy is a basic right, which is of particular importance as regards ending "energy poverty" (i.e. the lack of access to energy and its consequences) in the developing world.

**A "social" energy market**

Based on the previous points, making the energy market more "social" could be considered an important aspect of "democratisation". In addition to "democratic", "social" in this context can be defined as:

- Actors: rather than being dominated by "big business", the energy market should be composed of a diversity of actors from the "third sector" that are endowed with a social and environmental mission, rather than being focused on profits margins, and their organisational functioning and structure should be in accordance with democratic principles (see chapters on social enterprises and cooperatives)
- Prices and profits: prices should be transparent and accessible for all inhabitants and profits should mainly be used for expanding activities in the renewable energy sector and for community-purposes or, to put it differently, the "common good"

**Decentralisation and regional value creation**

As we have seen, the regional and local dimensions play an important role in nearly all definitions and concepts. In a study commissioned by the German Agency for Renewable Energies ("Definition und Marktanalyse von Bürgerenergie in Deutschland"), Leuphana University and the institute trend:research in their findings emphasise the importance of the territorial dimension of citizens' participation (trend:research & Leuphana, 2013, p.16-17). They point out that in around 90 % of all cases analysed, the membership of energy cooperatives is exclusively or predominantly local or regional and that the territorial radius in which they operate is on average limited to 30 km. There is therefore a clear link between the citizens and the place and community in which they choose to become active energy producers (idem, p.61).

It is self-evident that the principle "close to home" applies even more to private households that have installed photovoltaic panels on their own rooftops.

Furthermore, a very important economic argument for becoming independent from "big business" and instead producing and consuming energy locally is that the money stays within the region.

**Acceptance and participatory planning**

Moving away from centralised electricity generation also means that citizens "must learn to accept that energy production will again take place closer to home and thus be visible" (REScoop, 2015, p.61). A change in attitude is required among citizens and communities who dislike wind parks, etc. But a change in attitude is also required among policy-makers, planners and investors who may decide on locations for renewable energy generation, without involving the citizens and without taking the concerns of citizens and civil society organisations (be they environmental or other) seriously. Without a doubt, the more renewable energy utilities are installed around the countries, the more systematically participatory decision-making and planning processes will have to be implemented to ensure public acceptance.

**Financial participation and co-ownership**

Instead of "energy democracy", the term "Bürgerenergie" (or citizens' energy) is most frequently used in Germany. In their study, Leuphana University Lüneburg and the institute trend:research have analysed the concept of "citizens´ energy" from the perspective of the financial share that citizens have in renewable energy utilities and the related ownership models and organisational structures. They distinguish between two basic models of citizens´ energy (a narrower and a wider sense) (trend:research & Leuphana, 2013, p.15):

1. **"Bottom-Up": Active and own-initiative involvement of citizens, the community or other societal actors** in renewable energy projects in their communities, based on private or shared ownership:
- Installations privately owned by individuals and farms
- (Mainly local and regional) citizens´ energy cooperatives (in which citizens hold at least 50 % of the voting rights)
2. **"Top-Down":** includes other, usually larger, players (for instance, interregional investment companies, public energy providers / community-owned energy utilities, public credit institutions or similar) – often not originating from the local or regional level concerned - who invite citizens to financially contribute to their renewable energy projects ("Bürgerbeteiligungen" or citizens' participation)

The share of citizens´ energy in the European Union, defined this way, is the largest in Denmark and Germany. In Germany, which has already reached a 23 % share of renewable energies in gross energy production in 2013, 47 % of the renewable energy capacities (excluding offshore wind parks, which are capital intensive) are financed and have been installed by citizens ("Bürgerenergie" in the narrower sense as defined above), while the traditional energy suppliers ("Energieversorger") only hold a share of 12 % (see Figure 3)

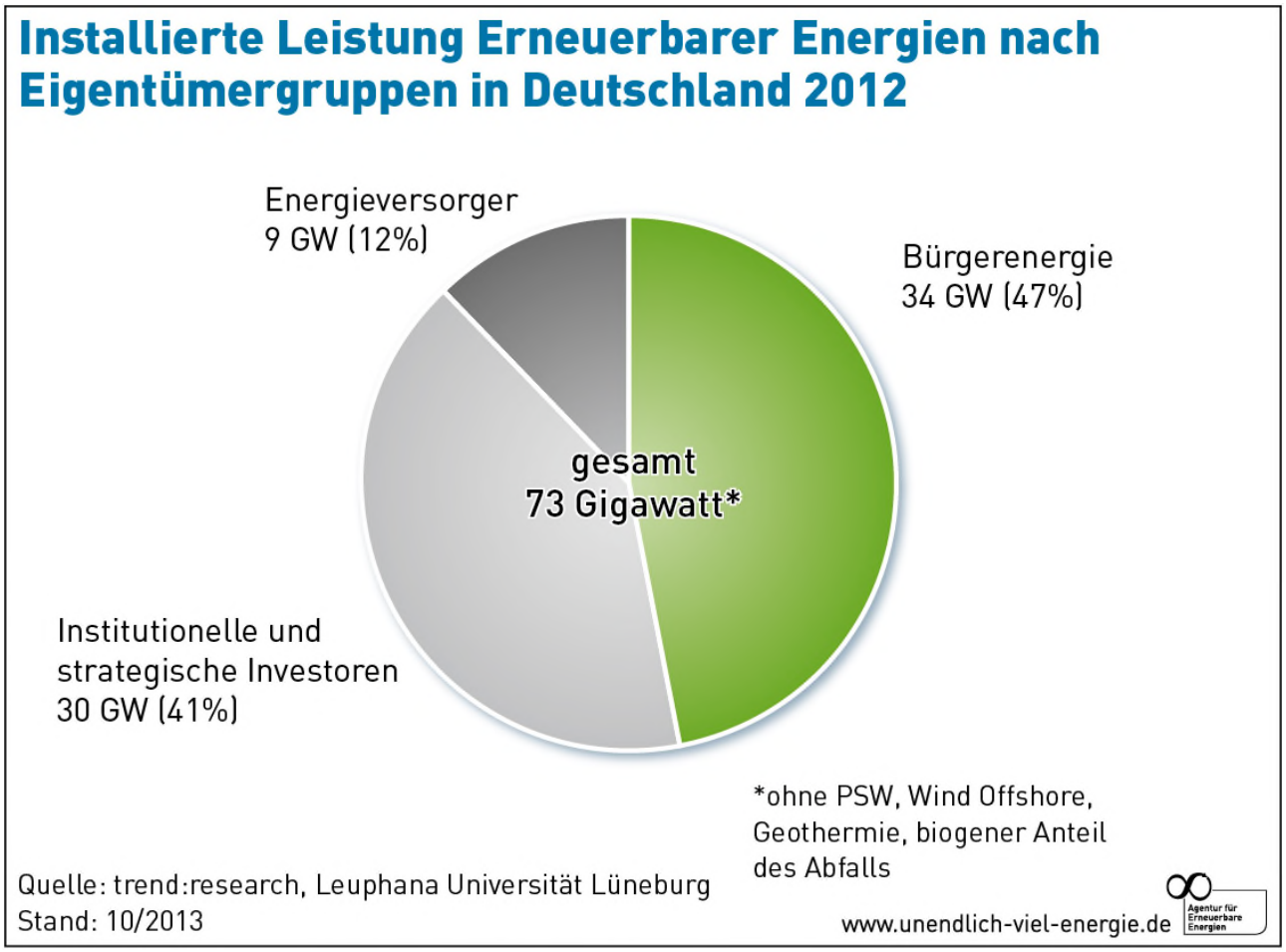


Figure 3: trend:research & Leuphana University Lüneburg, 2013, p.42

When taking a closer look at the citizens' energy in Germany (34 GW), it turns out that individual owners hold 52 % of all renewable energy installations, 27 % of projects have strong citizens' participation and energy cooperatives have a share of 21 %. The total number of energy cooperatives in Germany reached 973 in 2014 and continues to grow. While the PV sector is dominated by single households, energy cooperatives in Germany are particularly active in onshore wind utilities (especially in the North) (Agentur für Erneuerbare Energien, Renews Kompakt, 29/1/2014).

**Marketing models**

In the above, we have focused on energy production and ownership. However, taking "democratisation" another step further, one could also ask to whom renewable energy is sold and who consumes it. Three models can be distinguished:

1. **Indirect marketing:** Selling renewable energy to energy supply companies (either directly or via an energy market), which, in turn, sell their electricity to the consumers via the grid (thus, including a certain share of renewable energy)
2. **Direct marketing:** Selling renewable energy directly to the consumers via the grid (either owned or operated by themselves or by others), for instance, in the same region where the

energy is produced and with a guarantee that the electricity comes 100 % from renewable energy sources (**local direct marketing**)

3. **Self-consumption (prosumerism)**, including: **a) individual prosumers** who consume the electricity produced by their own private installations, being either autonomous (i.e. self-sufficient) or using the grid to balance deficits and surplus energy (selling and buying), and **b) collective prosumers**, where several users consume the energy produced by collective installations owned by themselves (e.g. energy cooperatives), being either autonomous or balancing deficits and surplus via the grid; prosumers would, thus, either not use the grid at all (if they are self-sufficient and autonomous) or could, alternatively, seek to own or operate the grid themselves to achieve even greater independence and autonomy.

Of these models, the third is the most democratic and clear-cut, as the electricity is owned, sold, bought and consumed by the same group of people (the co-owners/members). But the second model can also qualify as democratic, if, for instance, the direct marketing is done by an energy cooperative that sells its energy to other consumers (i.e. members and non-members). A hybrid model between the two models is also possible, if the members of an energy cooperative both buy and consume their own energy and, in addition, sell energy to other consumers (i.e. non-members). Furthermore, the most democratic forms of grid use would be grid ownership or operation by an energy cooperative (which, however, requires extensive technical know-how and investment).

In the following section, we shall take a closer look at social enterprises and cooperatives, on the basis of which we shall analyse our case studies.

## 2.2. Social Enterprises

### 2.2.1. What are Social Enterprises?

The full spectrum of social entrepreneurial activity includes operational areas such as health care, education and training, community regeneration, welfare projects, poverty alleviation through employment, and surely, environmental preservation and sustainable development, such as “green” energy projects.

The common objectives shared by social enterprises are:

- to provide goods and services which the market or public sector is either unwilling or unable to provide,
- to develop skills,
- to create employment,
- to foster pathways to integrate socially excluded people.

In Europe, the concept of social enterprise made its first appearance in the very early 1990´s at the heart of the third sector, which brings together cooperatives, associations, mutual societies, and with increasing frequency, foundations, or in other words, not-for-profit private organisations; some European countries labelled third sector as the “social economy”. Various foundations such as Schwab and Skoll embraced the idea that “social innovation” is central to social entrepreneurship and supported social entrepreneurs (Defourny & Nyssens, 2012, p. 3).

At the beginning of the 21st century, the Parliament of UK defined the social enterprise as "a business with primarily social objectives whose surpluses are principally reinvested for that purpose in the business or in the community, rather than being driven by the need to maximise profit for shareholders and owners" (Defourny & Nyssens, pp. 6-7).

**The Dimensions of the Social Enterprise (EMES Approach)** are divided into three important sectors:

| Economic and Entrepreneurial | Social | Participatory Governance |
|---|---|---|
| • **A continuous activity producing goods and/or selling services** | • An explicit aim to benefit the community. | • A high degree of authority |
| • **A significant level of economic risk** | • An initiative launched by a group of citizens or civil society organisations. | • A decision-making power not based on capital ownership. |
| • **A minimum amount of paid work** | • A limited profit distribution. | • A participatory nature, which involves various parties affected by the activity. |

Figure 4: The Dimensions of Social Enterprise. Defourny & M. Nyssens (2012), *The EMES Approach of Social Enterprise in a Comparative Perspective* (pp. 8-9) J. EMES European Research Network.

**Social enterprise as a combination of various actors, logics of action and resources**

The following is the first diagram that proposes how a Social Enterprise is involved.

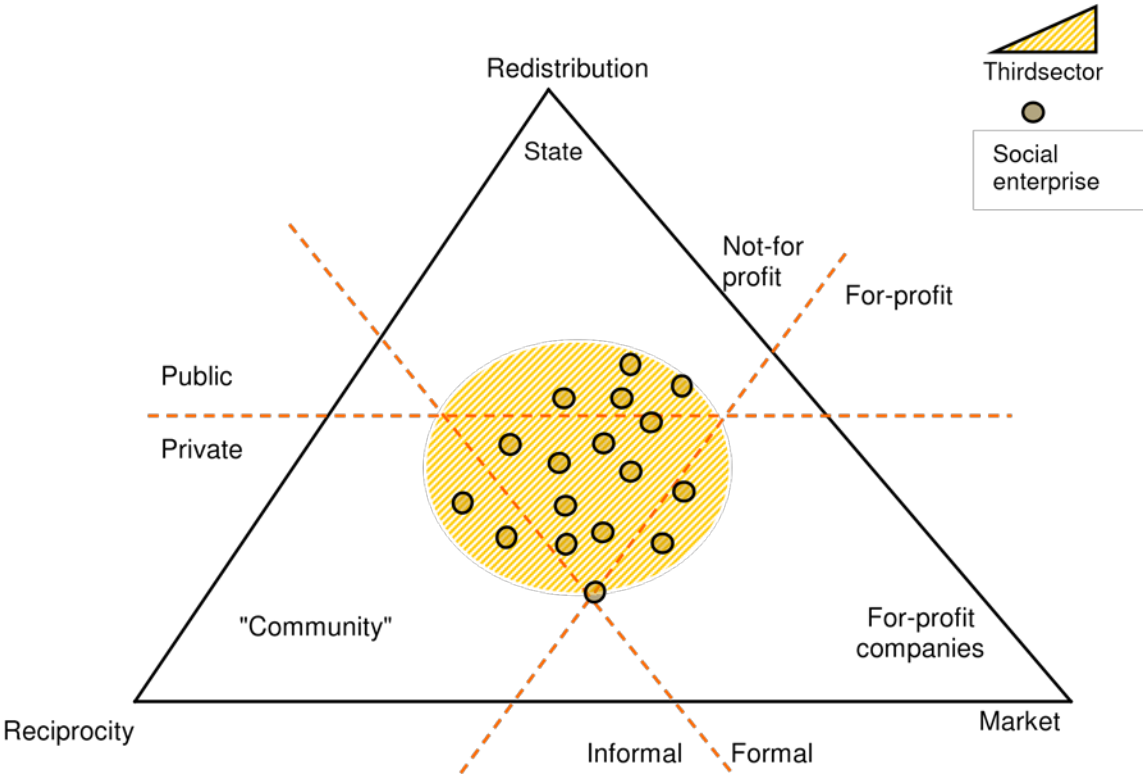


Figure 5: Social Enterprise as a combination of various actors, logics of action and resources. Defourny & M. Nyssens (2012), *The EMES Approach of Social Enterprise in a Comparative Perspective* (p.11) J. EMES European Research Network.

In this triangle, two typologies are identified. First, the different kind of actors: the state, private for-profit companies, and communities (in which, households can be included). And second, the resources and rationales on which these actors rely to develop their activities. The economy is seen as "plural" and it is characterized by three forms of change:

1. the market principle, which facilitates the matching of the supply and demand for goods and services through price setting;
2. the redistribution principle, whereby the production is handed over to a central authority – in our modern societies, generally the state- that is responsible for distributing it.
3. And the principle of reciprocity, which constitutes an original principle of economic activity based on the logic of symmetry. For Polany, as refered in Defourny & Nyssens (2012), actors committed in a reciprocity relationship are voluntarily complementary and interdependent. The cycle of reciprocity is opposed to market exchange because it is an integral part of human relationships that brings into play the desire for recognition and power.

As the figure shows, the third sector (cooperatives, associations, mutual societies, public benefit foundations, and all types of not-for-profit organisations -not owned by shareholders) can no longer

be viewed as fully separated from the private for –profit and the public sectors; indeed it appears as an intermediate sector. According to Evers, as referred to by the EMEA Approach, third sector organisations are not only in relation with redistribution and the market, but also with reciprocity embedded in the community sphere; this leads to recognize the great variety of ways in which these organisations act as hybrids (Defourny & Nyssens, pp. 10-11).

### 2.2.2. Funding Dimensions of Social Enterprises

The "hybridity" of social enterprises is well illustrated by this scheme of the European Venture Philanthropy Association (EVPA, see figure 6), which shows the positioning of social enterprises between "charities" and "traditional business" within the category "Social Purpose Organisations":

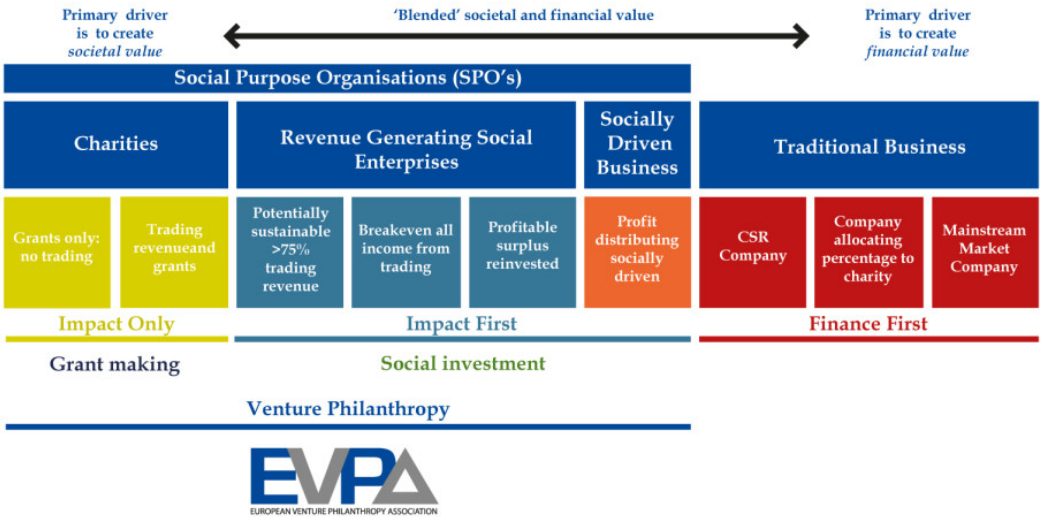


Figure 6: European Venture Philantropy Association, website: http://evpa.eu.com/about-us/what-is-vp/

Many social ventures can be highly entrepreneurial without generating independent profit streams: this could include innovation in the public sector, for example, pure welfare ventures. Therefore, the primary distinction lies in which funding model is adopted with respect to achieving a social objective, namely social enterprises look to move away from grant dependency towards self-sufficiency via the creation of income streams; ultimately, the aim is to be more sustainable.

There are two US schools of thought on social enterprise. The first school of thought on Social Enterprise, the "mission-driven business approach", refers to the field of social purpose venture as encompassing all organisations that trade for a social purpose, including for-profit companies (Defourny & Nyssens, p. 5). This kind of business model cover all its costs through the market resources; it is owned by investors who indeed do not receive any dividend; profits are fully reinvested to support the social mission.

The second school, "social innovation" emphasizes on the profile and behaviour of social entrepreneurs who, in the non-profit sector, are considered "change makers" as they carry out "new

combinations"; for instance, new services, new quality of services, new methods of production, new production factors, new forms of organizations or new markets.

*US Schools of Thought*

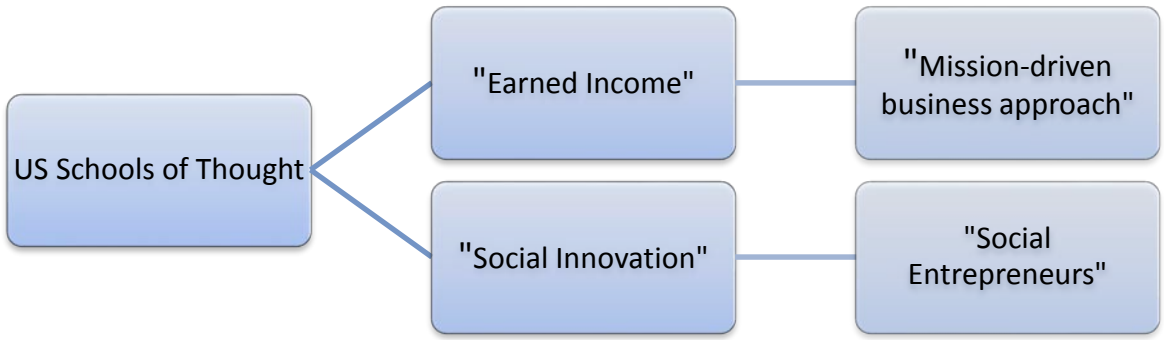


Figure 7. US Schools of Thought. Defourny & M. Nyssens (2012), *The EMES Approach of Social Enterprise in a Comparative Perspective* (pp. 4-6) J. EMES European Research Network.

In our project we shall focus on the social innovation approach and the question, how cooperatives, considered as social enterprises, as well as new models of production/consumption can contribute to change in the energy market and beyond.

### 2.2.3. The Governance Structure

| Autonomy of Governance Bodies | | |
|---|---|---|
| A participatory dynamics | Limitation on the rights of shareholders | Constraints on profit distribution |

Figure 8. The Governance Structure. Defourny & M. Nyssens (2012), *The EMES Approach of Social Enterprise in a Comparative Perspective* (p.10) J. EMES European Research Network.

- First, in a typical European approach, social enterprises are characterized by a high degree of autonomy. They are generally created by a group of people and are governed by them in the framework of an autonomous project. This condition of autonomy clearly diverges from the conception of the "Social Enterprise Knowledge Network" (launched by Harvard in Latin America), according to which a short-term project with a social value undertaken by a for-profit enterprise or a public body can be considered as a social enterprise.

- Secondly, the ideal-typical social enterprise defined by EMES is based on a collective dynamics and on the involvement of different stakeholders in the governance of the organization. Although non-profit organization compose a segment of the Luxembourg RE cooperatives, the membership structure is mainly made up of middle class consumers who live in the same commune. However, the national legislation recognizes the multi-stake holder membership. One of the aims of social enterprises is to foster democracy at the local level through economic activity. In that way, the third sector (RE Cooperatives) focuses on the community development and the solidarity economy approach, for which self-management is considered as a key criterion.
- Thirdly, one of the EMES criteria states that the decision-making power is not based on capital ownership; but the principle "one member, one vote"; again the quest for more economic democracy that characterizes the field of social enterprise in Europe, in line with the cooperative tradition.
- Fourthly, the rights of shareholders are also firmly limited as far as the appropriation of profits is concerned. According to the EMES criteria, the field of social enterprises includes organisations that are characterized by a total non-distribution constraint and organisations which may only distribute profits to a limited extent, thus avoiding a profit-maximising behaviour. The principle "one member, one vote" is clear.

### 2.2.4. Social Entrepreneurship and Social Entrepreneurs

Whilst social enterprise and social entrepreneurship are sometimes used as synonyms (particularly in the USA), the former is a fact of the latter fitting within a broad social entrepreneurship spectrum.

Social entrepreneurship is defined by its two constituent elements: a prime strategic focus on social impact and an innovative approach to achieving its mission. In other words, the social mission focus and the operational processes (Nicholls, 2006, pp. 11-12).

As the concept of Social Enterprises has been introduced, now it is the turn to define the leaders who drive such as organization.

Dees, as referred by Defourny & Nyssen (2012) defines the social entrepreneur as:

> "playing the role of change agents in the social sector by adopting a mission to create and sustain social value, recognizing and relentlessly pursuing new opportunities to serve that mission, engaging in a process of continuous innovation, adaptation, and learning, acting boldly without being limited by resources currently in hand, and finally exhibiting a heightened sense of accountability to the constituencies served and for the outcomes created" (p. 6).

Such outstanding individuals are often portrayed today as heroes of the modern times (Bornstein 2004).

Skoll, as referred to by Nicholls (2006), defines social entrepreneurs as:

"the practical dreamers who have the talent and the skills and the vision to solve the problems, to change the world for the better. Social entrepreneurs have a unique approach that is both evolutionary and revolutionary, operating in a free market where success is measured not just in financial profit, but lo in the improvement of the quality of people´s lives. Social entrepreneurs take workable value creation models and adapt them for the benefit of all our communities. They do not buy into the notion that only government and powerful individuals and corporations are in a position to determine where and how resources are allocated. They believe that any individual has the potential to make positive changes not just in our communities, but also in society as a whole" (Nicholls, A., 2006, v).

## 2.3. Cooperatives

To understand better how the public participation works in the democracy of energy systems, this section will provide concepts and principles of what means the pillar for several social economies: the cooperative model.

The General Conference of the International Labour Organization, defines the term „cooperative" as an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically controlled (and, thus, social) enterprise.

**Cooperatives in the World**

The following facts support the explanation of how relevant and impacting the cooperatives can be for some economies:

- Cooperatives comprise the largest and strongest pillar of the social economy in Turkey, with a total membership of 8.1 million people, organized in more than 84,000 co-operatives, functioning in 25 different sectors (Voinea, A., 2015, p. 3).
- Electric cooperatives play a key role in rural areas. In Bangladesh, rural electric cooperatives serve 28 million people. In the United States, 900 rural electric cooperatives serve 37 million people and own almost half of the electric distribution lines in the country. http://www.un.org/press/en/2009/dev2784.doc.htm
- Cooperatives are major job providers. They employ at least 100 million people worldwide. It has been estimated that the livelihoods of nearly half the world´s population are secured by cooperative enterprises. The world´s 300 largest cooperative enterprises have collective revenues of US$1.6 trillion, which is comparable to the GDP of Spain.

### 2.3.1. The Cooperative Model

In the history of cooperatives, there have been remarkable changes from the 19th century to the present time. The traditional fields such as banking, agriculture, and retail, have now been replaced by new fields of practice responding to current societal challenges; for instance, the respect of the environment (organic farming and consumption, renewable energy, insulation, etc.) New types of "multi-stakeholder" cooperatives (workers, consumers, producers, partners, etc.) have developed

new cooperative models oriented toward the general interest (not only the interest of the members) as institutionalized in several countries. In economic terms, cooperatives are a distinct form of business organization because they have a different model of ownership. By definition, "cooperatives are firms that are owned by their users rather than by their investors (as is the case of capitalist corporations)." This means that the former enjoy what is referred to as their "double quality": they are, simultaneously, members and users of the firm (Huybrechts & Mertens, 2014, pp. 195-196).

Their ownership rights take a very specific configuration:

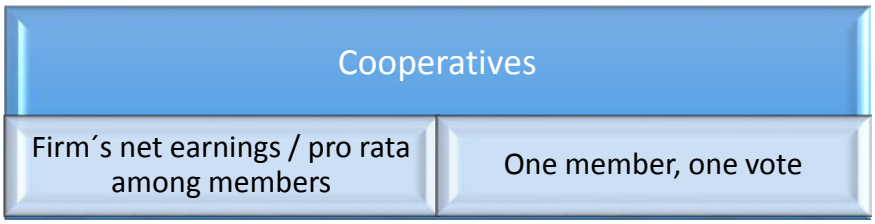


Figure 9: Huybrechts, B. & Mertens, S. (2014). *The relevance of the cooperative model in the field* of the renewable energy. Centre for Social Economy, HEC Management of School. University of Liege, Belgium.

According to the ILO, the following measures should be adopted to promote the potential of cooperatives in all countries:

- create and develop income-generating activities and sustainable decent employment,
- develop human resource capacities and knowledge of the values, advantages, and benefits of the cooperative movement through education and training,
- develop their business potential, including entrepreneurial and managerial capacities,
- gain access to markets and to institutional finance,
- increase savings and investment,
- improve social and economic well-being,
- contribute to sustainable human development,
- respond to the social and economic needs of the community.

The promotion and strengthening of the identity of cooperatives should be encouraged on the basis of:

| Cooperative Values | Ethical values | Cooperative Principles |
|---|---|---|
| **Self-help** | Honesty | Voluntary and open membership |
| **Self-responsibility** | Openness | Democratic member control |
| **Democracy** | Social responsibility | Member economic participation |
| **Equality** | Caring for others | Autonomy and independence |
| **Equity** | | Education, training, and information |

| | | |
|---|---|---|
| **Solidarity** | | Cooperation among cooperatives |
| | | Concern for community |

Figure 10: ILO. 2002. R193. Promotion of Cooperatives Recommendation from

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2196018

Cooperatives are important to the International Labour Organization mandate as both enterprises and organisations. "First, cooperatives are part of the world of work as they are labour market institutions. They are private sector enterprises and employers. They generate direct and indirect employment". Secondly, "as principle-driven, member owned organizations cooperative values are conducive to advancing social, economic, and environmental justice and workplace democracy" (Voinea, A., 2015, p. 2). Although the first principle does not match at all with the RE cooperatives in Luxembourg due to the highlighted voluntary work, the RE cooperatives seem to be aware of the social change promotion in favour of the local environment and communities. "As values-driven principle-based enterprises, cooperatives are natural and important partner for the ILO, partners in creating good-quality employment, partners in providing social protection for their member-owners and communities, and partners in giving voice and representation to those who have often found themselves excluded from democratic decision-making" (Polanski, S., 2014, p. 5).

### 2.3.2. Advantages of the Cooperative Model

The following list explains the most recognized advantages of the model:

1. The cooperative model has a competitive advantage because it engenders trust. The configuration of ownership rights prevents managers from engaging in opportunistic behaviour: the profit distribution constraint and the democratic governance system protect the members as consumers (Huybrechts & Mertens, 2014).
2. Giving ownership to the investors enables for-profit firms to access capital at a much lower cost and through more flexible solutions than if the same amount of capital had to be purchased on the market, typically through bank loans.
3. The cooperative is able to mobilize non-market resources and may, if its members agree, accept lower profits because it voluntarily supports additional environmental or social costs. The democratic model of governance used by cooperatives has also been described by Ostrom in Huybrechts & Mertens (2014) as one of the best solutions for the management of common resources.
4. Cooperatives are likely to emerge where some stakeholders (including consumers) have a strong advantage in becoming owners whilst having convergent interests. In these cases, cooperatives may enjoy competitive advantages through a privileged, "win-win" relationship with the key stakeholder group. Such a win-win relationship is likely to ensure loyalty of the members and attract other members over time.
5. Social change trend. RE cooperatives provide a "public good" when they contribute to responding to the climate crisis through reducing consumption. The promotion of

consumption reduction can be seen as a quasi-public good. This involves informing the consumers, making them aware of environmental issues, and giving advice to reduce consumption. Mainstream electricity corporations are not necessarily willing to reduce their customers' consumption.

### 2.3.3. Renewable Energy Cooperatives

Regarding to renewable energy, the RE sources have been developed since the end of the 1970s and their growth has been expansive since then. In an attempt to counter the corporate hegemony and to protect available lands, a sphere of citizen initiatives have emerged under different forms and names such as community energy groups or RE cooperatives. First examples include, for instance, EWS in Germany, Enercoop in France, Energy4All in the UK, Middelgrunden in Denmark, and Ecopower in Belgium. According to the REScoop network, on the approximately 3,000 RE cooperatives estimated in Europe, more than 80% are located in Denmark and Germany, with also relatively strong concentrations in Sweden and in the UK (idem, p. 201).

Today the RE cooperatives tend to differ from traditional cooperatives in several ways, for instance through the involvement of multiple stakeholders (rather than a dominant one such as producers, consumers, or workers) or through a stronger orientation towards general interest goals (beyond traditional mutual interest at the basis of most cooperatives). These new cooperatives including a general interest dimension can typically be described as "social enterprises", together with other organizational models combining a commercial activity with the pursuit of social aims (idem, p. 195, 197).

The potential of RE cooperatives appeared on different dimensions:

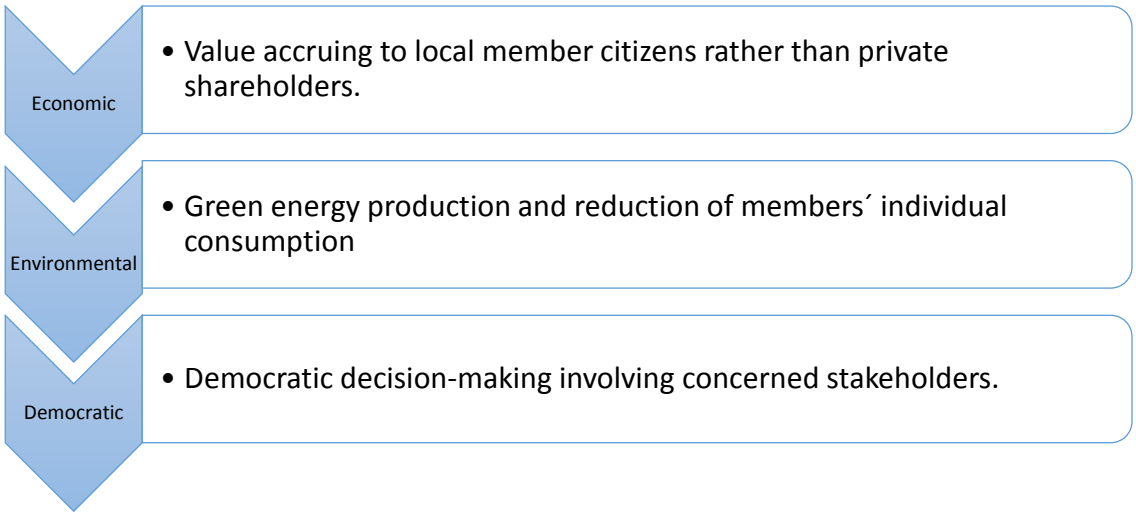


Figure 11: RE cooperative dimensions. Huybrechts, B. & Mertens, S. (2014). *The relevance of the cooperative model in the field of the renewable energy*. Centre for Social Economy, HEC Management of School. University of Liege, Belgium.

# 3) Legal & Policy Context of Renewable Energy Provision in Luxembourg

## 3.1. European Legal and Policy Context

### 3.1.1. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources

This Directive establishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport. It lays down rules relating to statistical transfers between Member States, joint projects between Member States and with third countries, guarantees of origin, administrative procedures, information and training, and access to the electricity grid for energy from renewable sources. It establishes sustainability criteria for biofuels and bioliquids.

It sets an overall target of at least a 20 % share of energy from renewable sources in the Community's gross (i.e. total) final consumption of energy in 2020. Within this framework, Luxembourg's target is 11%.

It sets the requirement that "Each Member State shall adopt a national renewable energy action plan".

### 3.1.2. Policy documents "Energy: New market design to pave the way for a new deal for consumers"

"Market design" is the set of arrangements governing how market actors generate, trade, supply and consume electricity and use the electricity infrastructure.

**Why do we need a new market design?**

Europe's electricity system finds itself in the middle of a period of profound change. The share of electricity produced by renewables will grow from 25% today to 50% in 2030. But when the sun is not shining and the wind is not blowing, electricity must still be produced in sufficient quantities to deliver energy to consumers and keep the electricity grid stable. The electricity market is constantly changing and today's market differs fundamentally from the market five years ago.

**What is self-consumption of renewable energy?**

Today, thanks to the significant reduction in technology costs, consumers can produce their own electricity on site from renewable energy sources (e.g. solar or wind power), and consume some or all of it, either immediately or in a deferred manner through small-scale energy storage (e.g. a heat pump or a battery). In this way consumers who produce can save money by generating their electricity rather than buying it, and even inject the non-consumed surplus electricity into the grid.

Self-consumption can help reduce grid losses as the electricity is generated and consumed locally. It can also lower energy system costs, for example in sunny countries (decentralised) solar

photovoltaic generation can help deal with peaks in demand driven by air conditioning. Finally, self-consumption can help mobilise private investment to finance the energy transition.

At the same time, self-consumption can raise new challenges and reduce grid operators' revenues. The grid may also need technological adjustments to maintain safety and reliability. The Commission has identified best practices to support EU countries to promote self-consumption in a cost-effective way.

**What role can energy storage play in the new market design?**

Secure operation of the grid has become more challenging with the rapid growth of variable renewables, and generators and consumers must be able and incentivised to respond to this flexibility challenge. Integrating storage in the electricity market would further increase the necessary flexibility: electricity should be stored when there is a surplus and prices are low; it should be released when generation is scarce and prices are high, smoothing out variable power production.

## 3.2. Luxembourg Legal and Policy Context

### 3.2.1. The National Renewable Energy Action Plan (NREAP)[1]

The NREAP is a key policy document that national governments were required to provide under the EU 2009 renewable energy Directive. The Luxembourg NREAP states:
"Renewable energies represent to Luxembourg a central pillar for the establishment of a sustainable energy system. The critical reasons for the promotion of renewable energies in Luxembourg lie in their contribution to environmental protection, supply security and economic development.
The Luxembourg policy for the development of renewable energies is based on three main areas. The utilisation of national potentials is a top priority. Here, an intensive development of the electricity and heat generation is desired. In the area of electricity, biomass and wind will, in the future, represent the two top performers. In the heating field, in addition to the development of a grid-connected heat supply based on biomass, decentralised heating production is also of great relevance. In households, the technologies of solar thermal energy and heat pumps will increasingly be used in addition to biomass. Luxembourg primarily intends to continue the promotion of renewable energies in the electricity sector through feed-in tariffs and investment incentives as well as in the heating sector through investment incentives.
The second component of the national strategy involves energy from renewable sources in the transport sector. Here the 10 % target established by the directive needs to be achieved. In this context Luxembourg is — due to limited land potential – focussing on sustainable biofuel imports by requiring that a percentage of biofuels be added to regular fuel, but also focussing on an ambitious national development of electro mobility in public transport and in private transport in order to meet the requirements.

[1] "Within the framework of the European Parliament and Council Directive D2009/28/EC of 23 April on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC"

The third main pillar is represented by the cooperation mechanisms. Based on limited national potentials and according to the current situation, Luxembourg must rely on this possibility in order to be able to reach its 11% overall target. Initial analyses suggest that a combination of joint projects and statistic transfers may represent the most effective solution.
Generally the Luxembourg strategy for renewable energies should make an efficient link possible between the energy and economic policies of the country. In this way, the creation of new jobs and investment opportunities as well as the stimulation of the economy will accompany the plan for the continuous development of renewable energies in Luxembourg."

### 3.2.2. Règlement grand-ducal du 1er août 2014 relatif à la production d'électricité basée sur les sources d'énergie renouvelables

This is the main Luxembourgish law currently in effect governing renewable electricity generation. As can be seen from the excerpts below, it is concerned particularly with the feed-in tariffs applicable.

The « official » text below is our translation of excerpts from the French original. Our comments are in italics.

Electricity produced from solar energy and injected into the network of a network operator through a power plant on the outside surface of a building, and of which the peak output is less than or equal to 30 kW is remunerated according to the following formula:

420 * (1-(n-2008) * 3/100) € per MWh

where n is the year in which the electricity is first injected.

*If n = 2012 this gives 36.96 euro-cents per kWh.*

*For a power station generating more than 30 kW up to 1 MW, the equivalent figure is 32.56 euro-cents per kWh.*

*For 2013*, electricity produced from solar energy and injected into the network of a network operator through a power plant installed on a weather-proof surface, and of which the peak output is less than or equal to 30 kW is remunerated at 264 euros per MWh (*26.4 euro-cents per kWh).*

### 3.2.3. Projet de règlement grand-ducal modifiant le règlement grand-ducal du 1er août 2014 relatif à la production d'électricité basée sur les sources d'énergie renouvelables

This new draft bill is intended to replace the 2014 law (above). At the time of writing it is still at the discussion stage.

The « official » text below is our translation of excerpts from the French original. Our comments are in italics.

From 1 January 2016, electricity produced from solar energy and injected into the network of a network operator through a power plant installed on a weather-proof surface, where the first

injection of electricity into the operator's network takes place after the 1st of January 2016, and of which the peak output is greater than 30 kW and less than or equal to 100 kW is remunerated according to the following formula:

$$160 * X * (1-(n-2016) * 6/100) \text{ € per MWh}$$

where X is in the range $1 \geq X \geq 0,7$; X is a reduction factor that may be fixed by the Minister. By default, X = 1 and n is the year in which the electricity is first injected.

*For 2016, this gives 16 euro-cents per kWh.*

*From 100 kW to 200 kW, the formula is:*

$$153 * X * (1-(n-2016) * 6/100) \text{ € per MWh}$$

*For 2016, this gives 15.3 euro-cents per kWh.*

NB In order to benefit from the remuneration described in this article, the energy producer must have the legal form of a cooperative company, made up only of physical persons and of at least 10 such persons.

### 3.2.4. Luxembourg Energy Market Policy - Barriers

- In principle, current legislation requires local power generators who consume their own electricity to pay "grid fees" – the fees paid by all consumers to the grid operator for the use of the network – even though they are not using the network.
- Administrative procedures, particularly for authorisation of new installations, are relatively long and complex - some EU countries have introduced greatly simplified (e.g. on-line) procedures to encourage citizens to become producers.
- Grid operation is a de facto monopoly, with by far the largest part of the grid run by CREOS. This makes it virtually impossible for local producers to take over a section of the grid and supply it locally – again, in one or two parts of Europe, communities have taken over their local grid and are managing it.
- Existing financial incentives are designed for the "feed-in" model, not for the needs of potential prosumers, whether individual or in associations.

# 4) Case Studies

## 4.1. Facts and Figures - Introduction

| Name | EquiEnerCoop | TM EnerCoop (Transition Minett Energy Cooperative) |
|---|---|---|
| **Year of foundation** | registered: 19th July 2012<br>project: "EquiSolar 2012" on 28th December 2012 | registered: 18th November 2013<br>project: in 2014 photovoltaic projects were established. |
| **Location** | 12, rue de Bourglinster, L-6112 Junglinster, Grand-Duchy of Luxembourg | 42, rue DJ Hoferlin, L-4136 Esch-sur-Alzette, Grand-Duchy of Luxembourg |
| **Legal form** | "société cooperative" | "société cooperative" |
| **No of members** | initially 142 members, now 140 members | 85 members |
| **Members characteristics** | members are mainly native, Luxembourgers living in the commune of Junglinster - middle-class;<br>individuals and non-profit organisations | mixed membership structure, different nationalities and social background; there is no requirement that members should live in Esch-sur-Alzette;<br>individuals and non-profit organisations |
| **Size of the installation** | above 30kW (Total installed power: 140,51 kWp)<br>installations in four locations producing about 125 000 kWh/year | below 30kW<br>two installation producing about 26 000 kWh/year each |
| **Management structure** | Board of administration with 3-11 members, elected by the General Assembly for 6 years (re-election possible)<br>General assembly with one member one vote rule<br>Supervision: external audits once a year | Board of administration with 9 members, elected by the General Assembly for 3 years (re-election possible); 12 founding members.<br>General assembly with one member one vote rule<br>Supervision: external audits once a year |

The communes in which the cooperatives are located have different characteristics. Junglinster (including Gonderange) commune is a „typical" rural area with a farming past. It has about 7000 inhabitants and it is the third largest commune in Luxembourg by area. The population is relatively

homogeneous, it mostly includes "native" Luxembourgers and is mainly middle-class. The municipality is a member of the KlimaPakt (Climate Pact, an agreement between the Luxembourg Government and participating communes/local authorities) and seeks to implement environmentally-friendly policies. The inhabitants have a well-developed sense of belonging to the commune.

Esch-sur-Alzette is the second biggest city in Luxembourg and second-most populous commune, with a population of over 33 000 inhabitants. The city was dominated by mining and the steel industry for over 150 years. In the 1970s during the steel crisis the mines and many of the blast furnaces were shut down. Nowadays it has a post-industrial profile; however the steel company Arcelor is still one of the main employers. The industrial past shaped the social landscape of Esch-sur-Alzette. The population is very heterogeneous (regarding income structure and nationalities), with a significant Portuguese minority. There are socio-economic disparities, and the "sense of belonging" is weaker compared to smaller communes. The TM EnerCoop, which is part of Transition Minett, is making efforts to reach the other social groups and to stimulate solidarity and social cohesion among people of different cultures and social backgrounds, but with limited success.

**Remark:**

Both cooperatives were established as a result of the previous activities of transition movements that already existed in the communes. In the case of EquiEnerCoop it was the consultative committee of 13 members, advising the Mayor in the decision-making process on new projects to help the commune to reach KlimaPakt goals.

In the case of TM EnerCoop it was the Transition Minett movement, which was established in 2011. Transition Minett focuses on encouraging people to participate and to make social and environmental change by production of renewable energy, urban gardening and organic food

According to its statutes the objectives of EquiEnerCoop are as follows (article 4.2 of the statutes):

- the construction, operation and maintenance of facilities for the production of renewable energy,
- the sale of the energy produced in the form of electricity and/or heat,
- the operation of energy sources and energy technology,
- to promote, support and advise on issues of renewable energy and energy efficiency, including providing information to members and third parties as well as public relations activities,
- The purchase and operation of equipment for the production of renewable energy.

According to its statutes the objectives of TM EnerCoop are as follows (article 4 of the statutes):

- to promote, produce and develop renewable energy through the construction, operation and maintenance of renewable energy generation plant, notably through the sale of that energy in the form of electricity and/or heat, and the purchase and distribution of renewable energy production equipment,

- promotion, towards both its members and the general public, of rational and responsible energy use,
- promotion, support, advice and information towards both its members and others with respect to all questions concerning the domain of renewable energy,
- promotion of local economic development by the creation of employment in the domain of renewable energy. The cooperative is thus not primarily committed to the enrichment of its members, who are only seeking a limited financial benefit. The cooperative is rather seeking to further citizen participation in local projects, both democratic and educational.

- The financial model of both cooperatives is presented in the table below (based on information from the interviewees).

| Name | EquiEnerCoop | TM EnerCoop (Transition Minett Energy Cooperative) |
|---|---|---|
| **Share price** | 25 euro (according to theoretical calculations the price would be approx. 92 EUR by now) | 100 euro |
| **Number of shares** | 328 | less than 1000 |
| **Members contribution** | Minimum: 1 share in the cooperative,<br>Maximum: 5 shares | Minimum: 1 share in the cooperative,<br>Maximum: flexible, but no single member can have more than 10 % of the total capital<br>Priority: as many members as possible |
| **Share distribution** | Assembly decides whether new member is allowed to join. | Board: can decide who is allowed to buy how many shares<br>Average of 10 shares per member but median about 4-5 shares. |
| **Dividends' policy** | No dividends policy so far (the profit should be re-invested in new projects in the commune)<br>The members are guaranteed a pay-back every year (a twelfth of their investment plus 2% interests) | Dividend limited of 5 % of total of individual shares.<br>Members vote how much they want to pay out in dividends. |
| **Feed-in tariff** | Fixed tariff for first 15 years of operations (till 2027).<br>Feed-in-tariff: 32,56 €cent /KWh | Fixed tariff for first 15 years of operations (till 2029)<br>Feed-in-tariff: 21 €cent /kWh |
| **Revenue** | about 40 000€/year | With 1st project: close to 5 000 €/ year |
| **Main costs categories** | metering cost to Creos<br>technical maintenance (1500€ per annum – not yet, because all the maintenances are done in-house)<br>cost of electricity to run the converters which are connected to the grid<br>administrative cost – fiduciary external auditor (recently the highest cost)<br>investments in hardware | hardware installations and maintenance |
| **Return on investments** | estimated at 12 years | estimated at 11 years |
| **Life expectancy** | 25 years but according to the manufacturer the efficiency of the PV decreases by 2% per year of usage | 25 years but according to the manufacturer the efficiency of the PV decreases by 2% per year of usage |
| **Customers** | Enovos | Sudstroum |

### 4.2. Objectives

The objectives of EquiEnerCoop and TM EnerCoop are presented (see figure 12) and discussed below.

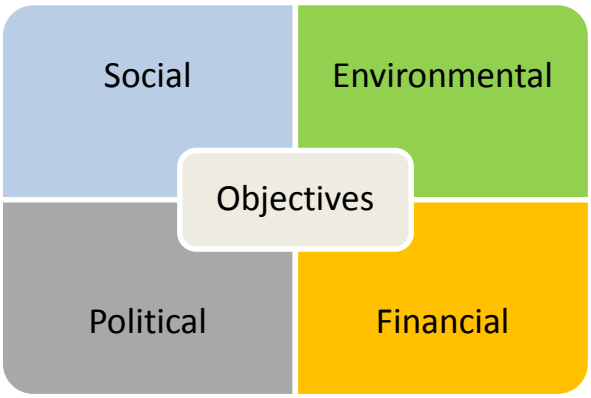


Figure 12: Objectives of the energy cooperatives

Environmental objectives

Both cooperatives aim to produce clean renewable energy and contribute to the reduction of $CO_2$ emission in their communes. They also provide promotion and "lecturing activities" to increase the environmental awareness of the members and other people in the communes, and to answer their questions and doubts about renewable energy production and rational energy utilisation.

In the case of EquiEnerCoop the focus is placed on helping the commune of Junglinster to meet its KlimaPakt goals.

In the case of TM EnerCoop there is a broader macroeconomic goal of creating a less oil-dependent society: "if we wait for the governments it will be too late. If we act as individuals it will not be enough. Only as communities, we can act in time and in an appropriate manner" (http://www.transition-minett.lu/). Through the creation of an energy cooperative, membership of which is voluntary and open to all, the co-operators are taking into their own hands the production of at least a part of the energy that they consume (article 4.1.2 of the TM EnerCoop statutes). The cooperative seeks to enable its members to consume the renewable energy thus produced.

Social objectives

The social objectives focus on building awareness and a sense of belonging to the community. Both cooperatives contribute to local development. The cooperative is run on a democratic basis, led by the members, who play an active role in the setting up of the projects and in decision-making. In cooperatives there is the principle of "one member one vote", which make people feel equal.

The EquiEnerCoop aims to change the inhabitants' attitudes towards environmental initiatives. From 2011 the consultative committee of 13 members was established to help the Mayor to take a decision on the new projects that could be undertaken in the commune to meet 2020 goals (for example, building energy efficiency projects). It was a top-down initiative. The decisions of the

consultative committee were not always welcome among the citizens, so there was a need to implement a more bottom – up approach. The EquiEnerCoop aims to get the citizens on board to have environmental projects done.

The TM EnerCoop is trying to reach less socially privileged groups in Esch-sur-Alzette. At present most of the members are middle-class Luxembourgish citizens. Efforts to encourage people from the working class to become members and to enhance their awareness of environmental issues are not successful so far. The cooperative seeks to develop local synergies between activities in the public, citizen and private sectors in order to create an impact in terms of sustainable development (see article 4.3.5 of the statutes).

Financial objectives

The financial objectives aim to create an entrepreneurial spirit. In order to run an energy cooperative there is a need for a business plan and project management. Also running a "business" is always of interest. The cooperative needs revenues, so there is an entrepreneurial challenge of managing the project properly. The feed-in tariffs are an important element of the financial dimension of the projects. In the sense of personal/social finances: there are also factors of social capital other than money. Investing in an energy cooperative is for a very long time. The purpose of the cooperative is to benefit its members in terms of their income and finances through joint business operations. Investing in an energy cooperative is not highly profitable but offers a stable return. For example, the TM EnerCoop statutes state: "Through its financial investments and its own activities, the cooperative makes sure that it generates both economic benefits for its members and environmental and social benefits, in a fair and balanced way" (article 4.3.2 of the statutes)

Political objectives

Both cooperatives use roofs of public buildings for their photovoltaic installations. They are dependent on local government decisions and support (for example only symbolic roof usage fees). They contribute to the environmental policy of the communes, by reducing the communes' $CO_2$ emissions and by the provision of local renewable energy.

In the case of EquiEnerCoop there is close cooperation with the local government and the cooperative is perceived as one of the most important tools for reaching the KlimaPakt goals. One of the cooperative's first tasks was to find out whether the roofs of the commune could be used for PV installations (request from the Mayor and his consultative energy commission). The cooperative paid only a symbolic one euro and signed a contract with the municipality for the right of use. The commune has an open-minded and proactive approach with a favourable regional context. This project helps to raise the commune's reputation and provides good publicity for the region. The cooperative was the first one in Luxembourg, it is widely recognised and perceived as a benchmark. There are quite good connections to politicians on the national level. The cooperative was consulted to give feedback on the new energy market regulations project.

In the case of TM EnerCoop the situation is slightly different. This may be because the commune is bigger and because of the more social than environmental focus of the local government. There is public acceptance, no one has ever pronounced themselves against the projects, but rather lack of awareness; most people have no idea what the cooperative's objectives and activities are.

## 4.3. Leadership and Members Organisation

### 4.3.1. Leaders' Profile

The profile of leaders

Both cooperatives have 9 founding members, with various professional backgrounds including: lawyers, businessmen, academics and researchers, engineers (mainly IT, electronics and telecommunications), baker. The founding members have different professional experience and complementary competencies that come together in working for the same goal. In both cooperatives the founding members had skills in IT, project management, finance and understanding of the legal issues. There was also need for someone good at marketing (including setting up a functional webpage for selling the idea to new potential members). A lot of work was voluntary, distributed among the nine founding members. All the founding members were acquaintances or friends, which helped to build up trust among them. The cooperatives are mainly based on voluntary work, so it is challenging to maintain momentum after the initial enthusiasm and engagement phase is over.

The founding members usually later become board members and one of them takes over as the cooperative's leader.

In the case of the EquiEnerCoop the leader is Jules Muller, born in 1951, living in Gonderange since 1988; he grew up in Junglinster. He is an engineer in electronics and telecommunications. During the initial phase the voluntary work was very intensive. The four board members spent up to 90 hours per month to start the operations of the cooperative. At present the work is less intensive but it still requires a lot of voluntary effort. Around 40 % of the time goes to closing the year, preparing the paperwork, including: annual reporting, then waiting to have the books closed (March-April), then planning the Annual General Meeting - to declare on a bi-annual basis the members, to register the figures in the "registre de commerce", to fill in the tax declaration, the VAT and to report to the fiduciary. The President's voluntary work for EquiEnerCoop takes up to 10 to 15 hours/month for:

- Communication with the energy provider & grid operator,
- Communication with other stakeholders (policy-makers, other citizens, NGOs),
- Communication with the members,
- Installations: expanding installations and/or maintenance,
- Administration: Accountancy & audit, statutory meetings, etc.
- Checking whether the system is running properly,
- Breakdowns and maintenance ( 4-5 days a year),
- Lecturing and promotion.

In the case of TM EnerCoop we conducted the interview with the Board Member Luis de Sousa, born in 1978, living in Esch since 2011. He moved there to work, coming from Portugal. His background is in geography, science and IT. For him voluntary work for TM EnerCoop in the incipient phase (2013) was very intensive, especially because of the statutes, a lot of time reading the law(s) etc., making contracts with different people. He was spending evenings and weekends – at least one evening per week looking through statutes or being at meetings. Since concluding the 1st project the work has become less time-intensive. The 2nd project was easier. It included installing solar panels at a school in Tétange in late December 2014. The work continues to get easier, because they have managed to find the right people to work with, especially the technical experts.

Motivation

The motivation factors of the founding members and leaders are mainly environmental and social. The financial motive was mainly driven by the availability of quite high feed-in tariffs, providing the necessary revenue for the cooperative.

Experience & Skills

According to Jules Muller the main skills required to start a RE cooperative are as follows:

- Understanding of the legal requirements and possibilities (in relation to the statutes of the cooperatives),
- Understanding of energy and grid technology (solar panels, grid connection),
- Understanding of engineering & security issues relating to buildings (construction, building security, fire protection, etc.),
- Understanding of economics, business,
- Understanding of the energy market & energy-related legislation,
- Understanding of how to run an energy cooperative, organisational understanding (ins and outs of the functioning and possibilities of an energy cooperative), including accountancy, taxes,
- Networking, negotiation & communication skills, social skills, stakeholder relations, diplomacy and negotiation skills (e.g. with locals and local policy-makers),
- Communication with the members and inter-personal skills.

According to Luis de Sousa the main skills that are required to start a RE cooperative are as follows:

- knowing how to run a business or organisation, or project management are not very important; more important is knowing the basic legal requirements,
- certification by the Chambre de Commerce is a legal requirement (business course –which teaches you how to run a small business),
- having knowledge of the legal and tax framework (the most important skill),
- accounting,
- technical skills,
- connections and networking skills, especially before starting the 1st project in order to find appropriate partners.

**Remark:**

Both cooperatives are managed by leaders with strong personal motivation and high environmental and social awareness. They perform their duties voluntarily in their spare time.

It is crucial to obtain the necessary human resources and ensure their resilience.

### 4.3.2. Membership & Organisation

Members - acquisition

In the case of EquiEnerCoop the number of members is stable, and all age groups are represented among the members (including children). Only two founding members, who were civil servants, had to leave because of legal constraints. Only people from the commune can be members in the existing project. New members will be allowed only with new projects.

In the case of TM EnerCoop there has been a significant increase in the number of members. It has almost tripled in the last year (from 31 to 85) and the forecast is that there will soon be over 100 members. The membership is not limited to Esch or Tétange, there are no limits to who can become members and actually members do not even need to live in Luxembourg. Members are required to attend the general assembly to ensure that the necessary quorum.

Members - composition & motivation

The members of EquiEnerCoop are neighbours, but from different political parties. Political ambitions play a big role (membership can affect the election of the new Mayor and the new commune council). The main motivation for members is that "they believe in renewable energy". It is more philosophy than business (no one invested the 1000 or 5000 EUR to become rich). All members are paid back capital and interest on a yearly basis (usually May/June of every year. This is part of the loan contract that has been concluded between the parties..

TM EnerCoop members have very different profiles. Some of them treat membership of the cooperative as a source of alternative financial return. Most of them are people with strong environmental and social concerns. The cooperative is still trying also to involve lower working class citizens, but there seems to be a lack of awareness for social/public initiatives generally in this group in Esch-sur-Alzette.

Organisation

Main advantages of being an energy cooperative:

- it gives a sort of legitimacy – when you present this to someone, it's clear to anyone that it is about more than making money,
- provides a democratic framework,

- it enables cooperation with local government (cooperatives are not companies); this is extremely important because of the use of public buildings/roofs for the PV installations,
- the money earned will be re-invested in new projects in the commune.

Main disadvantages:

The biggest problem and shortcoming is volunteer work, what means that leaders are doing their work in their spare time. They rely on 4 or 5 key people who invest a lot of time (who have networks in politics, other entities).

EquiEnerCoop perform most of the tasks in-house, based on the voluntary work of the members, mainly the board members.

TM EnerCoop plans to hire someone to manage the cooperative (CEO) or to extend the scope of the current support contract. The cooperative already pays an external partner for administrative and technical tasks.

### 4.4. Plans and Factors for Growth

The main factor which is now enabling the growth of energy cooperatives is the feed-in tariff. The feed in tariffs are relatively high in Luxembourg, more than covering the cost of hardware and maintenance.

At present solar and wind energy can only work with feed-in tariffs, but they do not cover the whole lifetime of the installation, only the first 15 years, although the technical life expectancy of the installation is 25 years. To cover current costs the minimal feed-in tariff needs to be at least 16 cents (depending on the costs of hardware, insurance and maintenance).

At present both cooperatives plan to start new energy projects. The have enough money coming from the members' fees/loans and feed-in tariffs to invest in new PV installations. An enabling factor is also that the prices of the hardware are declining every year.

EquiEnerCoop is considering equipping two new buildings in Junglinster (Sporthaal, tennis hall) and a water treatment utility with solar panels.

TM EnerCoop plans a third project in Schifflange and some other small projects like a youth centre (youth in Bettembourg have a garden, in which they want to install solar panels).

A constraining factor is the fact that systems are installed on rooftops not belonging to the cooperatives (right to use roofs over a certain number of years).

Another constraining factor has been the feed-in tariff limitation to 30 kWh installations. Finally, there has been a lack of transparency and clarity concerning the grid connection fees to be paid, which has made planning more difficult.

## 4.5. Conclusions and Recommendations based on the Case Studies

In these conclusions, we seek to answer two questions:

- Do the energy cooperatives provide a viable model for democratising renewable energy provision into the grid in Luxembourg?
- Are the energy cooperatives potential drivers of social change and innovation in Luxembourg?

We will address these questions at the micro- and meso-levels, followed by concluding remarks concerning the macro-level at the end of this chapter.

### 4.5.1. Micro-level: Energy cooperatives as "niche experimenters" in renewable energy production and ownership

**EquiEnerCoop and TM EnerCoop as successful social enterprises with limits**

Our case-studies have shown that both energy cooperatives have succeeded in accomplishing their environmental and financial objectives, namely producing and selling renewable energy and financing their investments and activities by "recruiting" a sufficient number of members from their communities (and beyond) willing to invest a sufficient amount of money. Both have developed a (social) business model that is truly innovative in the Luxembourg context and economically viable until the end of the guaranteed feed-in tariffs. Any profits are (or will be) returned to the members or re-invested in more joint projects serving the community. Both have developed organisational structures that guarantee democratic member participation and shared ownership. The board members have acquired an impressive variety of skills and expertise in running the cooperatives' activities, successfully sharing their tasks and complementing and learning from each other. They have also succeeded in gaining political recognition and support from the local municipalities and forming multi-stakeholder networks, including public authorities, NGOs and businesses. Both have carried out a significant number of training and awareness-raising activities, in order to increase environmental awareness and become better known among citizens.

Overall, we therefore conclude that the energy cooperatives have succeeded in implementing their main objectives.

**Enabling factors**

It is worth pointing out the main enabling factors and framework conditions for their success:

- **Legislation, grid regulation and financial incentives:** It is safe to say that without the possibility of feeding renewable energy into the grid by selling it to established energy suppliers and receiving guaranteed feed-in tariffs for 15 years, the energy cooperatives would not have been established. Only these factors could provide the planning and investment security necessary for members to be willing to invest time and money.
- **Political and public support at local level:** The fact that the two cooperatives have been established successfully is to a large extent also due to a favourable political climate,

namely, a high degree of political support from local councils and authorities eager to fulfil their KlimaPakt commitments and to help when obstacles were encountered. Moreover, the fact that the cooperatives managed to gain citizens' support and "recruit" members within short periods of time, the numbers and the level of investment exceeding expectations, demonstrate that many local citizens identify with the climate commitments of their municipalities and are eager to contribute to them. There seems to be a shared sense of purpose and common understanding of the climate challenge.

- **Leaders / pioneers**: Both cooperatives have had founding members and a leadership structure composed of people with a strong commitment to the common cause and the necessary skills and competences. Combining different profiles and benefiting from personal networks, they have complemented each other in carrying out the many different tasks involved in developing and setting-up a new organisational structure, gaining public and political support, mobilising members and taking care of the technical PV installations. Any expertise that they did not possess, such as in legal and financial matters (statutes, grid regulation, fire-protection rules, insurance, financial reporting rules, banking, etc.), has been acquired thanks to significant personal efforts and "learning by doing". The way in which the cooperatives were established corresponds to the principles of self-help and self-organisation, necessitating a strong sense of initiative and ownership, autonomy and creativity, particularly when overcoming obstacles. Finally, an important factor in gaining political and public support and building multi-actor networks has been the fact that the founding members and leaders have a good reputation as trustworthy and competent partners.
- **Organisational structure and membership:** It seems fair to say that the relations between the members (including the board members) are characterised by trust, equality, fairness and a sense of community, or "we-identity", in which communication plays a crucial role. In fact, neither of the cooperatives seems to have experienced any serious conflicts. Everyone seems to be convinced that the members act in the common interest and for the common good, based on a principle of reciprocity. They also seem to share a common vision and understanding of the importance of renewable energy and the local level for succeeding in the "energy transition" and reducing CO2 emissions. In short, all factors for a successful cooperative partnership seem to be in place.

To sum up, the main success factors for the two energy cooperative have been favourable framework conditions (public policy), a competent, committed and trustworthy leadership as well as a sense of community and shared purpose among (mainly local) inhabitants. Their ability to organise themselves, to surmount obstacles, to put up their project and to mobilise significant resources within a short time is impressive.

The cooperatives seem, then, to be living proof of how the local level can be a fruitful ground for experimenting with innovative and participatory initiatives to tackle complex sustainable development issues. In Esch and Junglinster various stakeholders and citizens have, indeed, found

new ways of working together and setting up an innovative, democratic and social model for renewable energy production.

**Weaknesses and potential paths for further development**

At the same time, the cooperatives in some ways still appear to be "niche experimenters" with limited growth prospects (i.e. for increasing their activities), if they do not reform their structures to a certain extent. Moreover, one could argue that they have not yet taken social entrepreneurship, the environmental cause, democratisation and civic involvement all the way. Last but not least, their current business model can be expected to come to an end in the medium-term.

A number of potential challenges thus lie ahead:

- **Feed-in tariffs and planning security**: The guaranteed feed-in tariffs of the cooperatives will expire after 2027, while the life expectancy of the PV installations is roughly ten years longer than the guaranteed feed-in tariffs. As EU and national policy-makers move increasingly away from the idea of providing direct subsidies for renewable energy production, the end of the current business model is already in sight, at the very least for the current PV installations. In the coming years, the cooperatives will have to start thinking about what will happen after 2027, when the PV panels will continue to produce electricity and continue to require maintenance, but will only bring in significantly reduced revenues.
- **Professionalisation / formalisation**: Relying exclusively on volunteering means that there are limits to how many more projects can be carried out. This is a question not of financial capability, but of how much additional work can be shouldered by the leaders, i.e. their personal resources. In fact, the more and the bigger the projects, the more unsustainable does it become to rely on volunteers only. The financial and organisational risk would simply be too big, considering the possibility that any of the handful of lead members may suddenly no longer be available. At the same time, there is even a statutory requirement to re-invest profits in community projects, rather than simply to make the members "richer". As a consequence, it makes sense that the cooperatives, or at least some of their board members, consider employing staff - even if this, undoubtedly, would alter internal dynamics and could even be a potential source of future tensions (Defourney & Nyssens, p.12).
- **Local added-value and democratisation**: Although aspiring to changing the paradigm of the energy market in Luxembourg, the cooperatives currently depend on established energy suppliers to buy their electricity via a grid that is operated by quasi-monopolists. In the long-term, this does not seem satisfactory, as the resource energy leaves the local communities to be sold elsewhere by a profit-making company that is unlikely to re-invest any profits for local community purposes. It may, therefore, make sense for the cooperatives to consider taking democratisation and ownership a step further, once the guaranteed feed-in tariffs have ended. One possible path could be to turn the public buildings on which the PV panels are installed into prosumer units with storage capacities (batteries or possibly some alternative system). Another path could be to market the electricity directly to local consumers and seek to make the municipalities autonomous of other suppliers. This would

however require a significant investment and increase in renewable energy capacities and, consequently, further substantial professionalisation. It could even lead to reflections on grid fees and use, with grid operation being the ultimate possibility, which could be considered. As examples from Germany show (see chapter 5.1.), the energy cooperatives could consider setting up their own companies to market electricity and offer specific energy services, invest further in renewable energy installations and run the local grid. This would take professionalisation even further and, potentially, create jobs locally. At the same time, becoming more market oriented would also radically change the nature of the cooperative and, most likely, provoke tensions concerning its democratic and social values (Defourny & Nyssens, p.10).

- **Influencing member behaviour**: As the cooperatives' members do not use the electricity they produce themselves, it is difficult to say whether their energy consumption has been reduced as a result of their involvement in the cooperatives. It is also difficult to determine whether there has been any increase or change in the members' participation in other civic or political processes. Investigating whether membership in an energy cooperative has an impact on consumption patterns and civic participation could be an object of further research.
- **Diversifying membership**: As has been shown, the membership of the cooperatives seems to be dominated by people from the middle class with a strong and long-standing affiliation to the municipality in which they live. Most of them seem to be Luxembourg nationals or foreigners who have lived in Luxembourg for a long time or have Luxembourgish spouses, and they seem mostly to be people with higher education. Reaching out to less well-off people with working-class and foreign family backgrounds (much more present in Esch than in Junglinster) has been a declared objective of the TM EnerCoop, but so far to no avail. Mobilising people with different socio-economic and cultural backgrounds seems to be a "hard nut to crack". A model remains to be found.

Based on this analysis, we conclude that the two energy cooperatives, at least until the end of the next decade, provide viable but, so far, limited models for democratising renewable energy provision in Luxembourg. The very first energy cooperatives in Luxembourg, they are the result of a capacity for social innovation and a spirit of social entrepreneurship at the local community level as well as at the personal level of the pioneering members. In the coming years they will, however, have to start thinking about whether to professionalise and scale-up their energy business or whether to continue operating micro-projects with, in the future, limited financial return.

### 4.5.2. Meso-level: How to scale-up energy democratisation and renewable energy production?

When addressing the meso-level, we need to ask whether and under which conditions the energy cooperatives could set an example for or even trigger wider social change and deeper transformations in Luxembourg. Are they scalable and transferable? Do they have the potential of

contributing to the emergence of a “patchwork of new regimes”? Which measures can public policy take to support the process and similar initiatives?

**Capacity- and field-building**

In Luxembourg there is not yet a real field of collective and decentralised renewable energy production. Although increasing, the 3 % share of renewable energies in the overall electricity production is disappointingly low. And, currently, there are only three energy cooperatives in Luxembourg (EquiEnerCoop, TM EnerCoop and Energy Revolt in Beckerich). Without doubt, a field has yet to emerge.

Considering the efforts, competences and skills it takes to set up and run energy cooperatives, one public policy measure could be to offer more advice and support on legal, technical, financial and insurance matters to citizens interested in creating energy cooperatives or similar ventures.

Policy-makers seem genuinely interested in building the field. The ministries of economy, housing and sustainable development have thus jointly set up a national structure, myenergy, to support, particularly, individual citizens and enterprises in energy projects. They have also published a leaflet to promote the setting up of energy cooperatives (“Trouvez 9 alliés et créez une cooperative énergétique! Finde 9 Mitstreiter und gründe eine Energiekooperative!”), referring to the possibility of cooperatives receiving feed-in tariffs for utilities between 30kW and 200 kW as of 1 January 2016. In the leaflet they encourage citizens to contact myenergy, the Centre for Ecological Learning Luxembourg (CELL, a non-profit organisation) or the three existing energy cooperatives for more information. It seems that, despite these contact points, the information offered on the respective websites is still very general and rudimentary. For more extensive information and support, myenergy refers to the possibility of resorting to external consultants.

One way of supporting field-building could thus be to extend the services of myenergy and provide more detailed information on the internet.

Furthermore, one could question why energy cooperatives need to be set up by ten “physical” persons. With a view to strengthening multi-stakeholder networks and public policy participation (e.g. municipalities and local councils), it would seem to make sense to allow non-profit organisations and public structures to participate in the founding of cooperatives, thereby widening the target group and opening the field.

Last but not least, other measures could also be considered to strengthen the field of “citizens’ energy”. They could include supporting and providing information about other possible forms of energy ventures, such as public-private partnerships and interregional investments, in which citizens are invited to participate and purchase shares (see chapter on energy democratisation). In the interest of the dynamics and diversity of the emerging field, it seems reasonable to look at examples from countries such as Germany.

Public policy efforts should take into account a wide range of possible entrepreneurial forms that encourage citizens' participation. Although majority-owned by commercial energy suppliers (as well as the Luxembourg state), the example of the enterprise SEO nonetheless shows that there can be other – more intermediate and "weaker" – forms of citizens' participation in local energy projects. SEO invites citizens living in municipalities in which it has projects to buy shares.

When seeking to increase citizens' acceptance and involvement in renewable energy projects then, other models should not be excluded.

To adopt a more pragmatic stance, private ventures could therefore also be considered to contribute to building the field of citizens' participation, especially if they have a certain degree of social orientation and are not exclusively guided by commercial interests (SEO, for instance, prides itself on the label "entreprise socialement responsable").

**Supporting a decentralised energy landscape via smart community grids**

One of the biggest public policy and technological challenges will be to set up grids suitable for decentralised electricity generation that will result into a "two-way, new, decentralised energy landscape" (YEEPS, p.9). In a Scientific and Policy Report by the Joint Research Centre of the European Commission, the authors Mengolini and Vasiljevska elaborate on the vision of "community grids" relying mostly on local energy sources and storage. These grids would be part of a future smart grid, which will be characterised by a distributed mode of operation (JRC, 2013, p.31). The authors emphasise that, "for the smart grid to be successful, policies should be designed to enhance the autonomy of communities", such that their need for power supplied by central plants will be limited. Most electricity would be produced and consumed locally. Communities of end-users would get together and interact and trade with each other based on their consumption patterns. According to many scholars, direct energy exchange would intensify "the community feeling" (YEEPS, p.13)

At the same time, many authors point out the need for public policy support for these communities as well as the need for intermediary networks. The communities will hardly have sufficient resources to manage all aspects of their energy production and consumption (JRC, 2013, p.32).

We will further elaborate on this vision in the following chapter dealing with Prosumerism (see 5.1.). Suffice it to say at this point that grid policy and design, in the end, will determine the technological potential and limits of energy democratisation and decentralisation in Luxembourg.

**Transferability and scalability**

The cooperatives that we have analysed provide successful models for energy democratisation. They are, in principle, transferable to other municipalities and projects.

Setting up an adequate grid infrastructure and design with clear and transparent rules may encourage more citizens and municipalities to found energy cooperatives. This would also be a pre-condition for a "patchwork of regimes" to emerge, leading to deeper and wider changes in Luxembourg.

Based on our analysis it seems most likely that more energy cooperatives will be created in communities sharing the characteristics of the communities in Junglinster and Esch, namely:

- Strong existing networks between people, including Luxembourgish citizens
- Strong sense of territorial affiliation (i.e. sense of belonging)
- Good relations with local stakeholders such as public authorities, policy-makers and management of public buildings (such as schools)

However, these favourable conditions may not necessarily exist everywhere. Some places in Luxembourg are much more heterogeneous, in terms of both the cultural and the socio-economic backgrounds of their residents, and may lack strong civil society networks or a strong sense of community. As experienced by the transition movement in Esch, it may therefore be more difficult to mobilise people in places where some of these characteristics are less present. There, community-building efforts may have to precede or be combined with efforts to mobilise more people for energy projects.

In addition, it needs to be kept in mind that social enterprises and cooperatives are often a response to market and public policy failures. This is the reason why they are more numerous and have more important roles in many developing countries than in the European Union (see chapter 2.3.). By contrast, life in Luxembourg is comfortable. There is no immediate necessity or urgency to take energy generation into “your own hands”.

Moreover, energy is affordable and still relatively cheap (even more so, with dramatically falling oil prices), representing a small fraction of most people’s incomes. In this context, there may therefore be limits to how many people can be mobilised for idealistic volunteer projects, even if there is widespread awareness of climate change and depleting natural resources.

**Financial incentives and public investment in (social) housing projects**

In the end, it may therefore be financial incentives and large-scale investments that decide on the fate of the energy transition and democratisation in Luxembourg. The reason why so many private households have installed solar panels in Germany (where single households and farms represent 52 % of all installed renewable energy capacity) can be found in state incentive schemes that are (or were) available to house-owners. At the same time, one could assume that it has predominantly been well-off people who have used these schemes.

What does it take to involve and reach more people and other socio-economic strata with renewable energy projects? Could the experience of the energy cooperatives perhaps be transferred or extended to other models of renewable energy production (and consumption)?

At this point, we would like to propose an alternative path to take renewable energy production and energy democratisation forward. We propose there to be strong incentive schemes in place for any medium- or large-scale housing and urban development project in Luxembourg concerning the installation of solar panels and/or other renewable energy equipment. One of the conditions should be that buildings are constructed in such a way that they produce and use renewable energy and

could, in principle, become prosumer units. The incentive schemes should not only apply to buildings composed of owner-occupied flats, but also, and even more so, to buildings with rental apartments, including social housing. This would require large-scale public investment. Projects could be carried out in public-private partnerships. The concept of "Prosumerism" as well as the potential role of cooperatives in such projects are described in chapters 5.1. (examples from Germany) and 5.2..

All in all, we are convinced that transformational changes at the macro-level will only take place in Luxembourg if significant amounts of money are invested in innovative housing and territorial development projects. This will only happen if there are financial incentive schemes to support such investments. Urban and rural planning, along with the construction sector, needs to adapt to or even drive changes in energy regimes, in partnership with other stakeholders and experts. This is why Jeremy Rifkin has made the construction and housing sector the second pillar of "his" Third Industrial Revolution and, as a pointer towards the prosumer idea, this is why storage technologies constitute the third pillar (Rifkin, 2011, p.37). Together with new smart grids (pillar 4), these, indeed, seem to be the most important elements of a "revolutionary" change of paradigm in the energy sector and society as a whole.

Energy cooperatives are just one brick in the building of the transition. They need to be complemented by many other initiatives and measures, in order to result in bigger transformations. But there is a lot to be learned from energy cooperatives and, without any doubt, they have their rightful place and role in the energy transition, especially at the local and community level.

## 5) Prosumerism as an Alternative (Business) Model

Democratising the energy market in Luxembourg should include the following possibilities:

- Localising the production and consumption of energy (prosumerism), and
- Management by local communities.

The current situation in Luxembourg is that local production already takes place, as our cases have shown. However the local production is not providing independence from the big players on the energy market, because so far they are the only customers of the RE cooperatives. Localisation should mean independence of energy production and supply and securing the "common good". So far the case studies demonstrate that renewable energy consumption in Luxembourg is not localised. The democratising of the renewable energy provision to the grid requires a large number of small installations and the development of the prosumer concept.

### 5.1. Prosumers and their Role in Democratising Energy Markets

In the last few years the EU has announced that consumers would be placed at the core of the EU energy policy, especially regarding the production and usage of renewable energy. The Energy Union strategy (COM/2015/080) 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".

Renewable energy is essential for meeting the Energy Union objectives, as follows (COM/2015/080):

- the delivery of security of energy supply,
- a transition to a sustainable energy system with reduced greenhouse gas emissions,
- industrial development leading to growth, more jobs and lower energy costs.

Prosumerism is a new approach, whereby former passive customers (businesses and households) becoming active by "self-consumption" of in-house produced energy. The self-consumption rate is the amount of electricity consumed on site as a percentage of the total electricity produced. This "self-consumption" might be immediate or through decentralised storage, behind the connection point with the grid. Prosumers operate on micro and small-scale renewable energy systems, typically with an installed electricity capacity below 500 kW (COM/2015/080).

A key condition for development of prosumerism on the energy market is so-called grid parity. Grid parity means that "an expected unit cost of self-generated renewable electricity matches or is lower than the per-kWh costs for electricity obtained from the grid" (COM/2015/080). The advantages of prosumerism are as follows:

- empowering consumers on the energy markets,
- encouraging new more efficient energy consumption patterns – when shifting to self - production of energy consumers start better to understand the mechanisms behind calculation of the energy prices, they are also capable of using the energy more efficiently.
- balancing energy consumption in the grid (potentially reducing energy usage peaks),
- reducing energy costs,
- reducing consumers' exposure to energy price changes.

The solutions supporting prosumerism are as follows:

- smart grids,
- metering techniques,
- new financial instruments to make self-consumption widely accessible to consumers from all income levels,
- renewable energy storage technologies,
- simple administrative and, in particular, authorisation procedures,
- smart electric appliances,
- smart home energy management devices.

The grid design and the metering should allow the grid operators to facilitate consumers' participation in the wholesale market. Smart pricing should also be introduced. Smart pricing could be a tool to facilitate better demand-side energy management. "A progressive volumetric tariff encourages self-consumption, as it increases the per kWh electricity price that can be substituted by self-consumed electricity, thus leading to a reduction of the daily/seasonal peak consumption"

(COM/2015/336). The tariffs for energy consumption should avoid the discriminatory charges for self-consumption projects, at the same time guaranteeing sufficient funding for grid and system costs.

The metering techniques which support prosumerism are as follows (COM/2015/336):

- net metering - a regulatory framework under which the excess electricity fed into the grid can be used later to support consumption when the onsite renewable generation is absent or not sufficient. The major concern about net metering is that consumers with renewable energy self-generation are using the grid to artificially store their electricity for further consumption, even when the value of electricity differs substantially between the different time periods.
- net billing – it calculates the value of the excess electricity fed into the grid at wholesale price.

The new financial instruments, which are already available in some of the EU Member States, enable the subsidy of small-scale renewable energy projects and make the necessary infrastructure investments more affordable for consumers from all income levels.

The administrative procedures for authorisation of feeding energy into the grid should be as simple as possible. In countries where prosumerism is very popular (e.g. Portugal, Italy, Sweden), simple on-line tools for registration and notification of small-scale self-consumption projects are often available.

The common usage of smart appliances (e.g. washing machine, dishwasher, refrigerator) also helps to reduce peak energy consumption and results in better management of the peak power demand on the grid (reducing local voltage fluctuations and congestion problems).

In many European countries (including Luxembourg) the grid is designed as a “distribution grid” not a “production grid”. This means that prosumers should store their unconsumed energy themselves instead of using the grid as a storage system for their excess power production. The batteries installed by prosumers help by storing excess onsite renewable electricity in periods of low demand, for use in periods when energy demand is high and renewable production is low (COM/2015/336). The batteries allow the renewable energy to be used more efficiently by decoupling generation and consumption. Thanks to the development of technology, it is now easier to achieve economies of scale in the production of batteries. As a result their prices are constantly decreasing.

The EU experts estimate that installing decentralised storage capacity makes it possible to increase the self-consumption rate - from 30% to 45% and even 75%, depending on the demand profile (COM/2015/336).

### 5.1.1. Challenges for the Development of Prosumerism in Luxembourg

Grid parity assumes the optimal situation, that 100% of the electricity produced is self-consumed. Very often this situation cannot be achieved in the case of households or companies. Consumers

producing renewable energy may still need to feed their non-consumed electricity into the grid, or to obtain the energy from the grid if their own production is not sufficient (for example during winter time for PVs). At present this causes a number of problems. In Luxembourg there is a lack of simple and easily accessible tools and procedures for the administration and authorisation of grid feed-in.

The EU regulations aim to encourage consumers to increase their direct consumption of self-produced electricity rather than feeding it into the grid. Article 16(8) of the Renewable Energy Directive (2009/28/EC) requires Member States to "ensure that tariffs charged by transmission system operators and distribution system operators for the transmission and distribution of electricity from plants using renewable energy sources reflect realisable cost benefits resulting from the plant's connection to the network. Such cost benefits could arise from the direct use of the low-voltage grid". According to the Institut Luxembourgeois de Régulation (ILR), in order to encourage prosumerism, incentives other than feed-in-tariffs should be implemented for injecting energy into the grid.

The cooperatives declare in their statutes their aim of encouraging their members to consume their own energy. However in reality it is very difficult. The feed-in tariffs, which do not make it interesting economically to consume your own energy, discourage today's energy producers from becoming prosumers. The factor motivating moves toward prosumerism is that the feed-in tariffs are dropping in many of the EU Member States and they will probably be phased out completely. This is already a concern to the existing cooperatives, which will face this problem at end of the 15-year period of guaranteed feed-in tariffs.

The price per kWh is relatively steady in Luxembourg (about 17 eurocent per kWh). Energy prices for households are currently made up as follows:

- electricity: 5,42/kWh (the only element subject to competition),
- grid fee: 6 ct/kWh plus 2 EUR per month plus 31 EUR / year (for renting meter)
- compensation fund 2.95 cents/kWh plus electricity tax 0.1 cents/kWh
- Reduced VAT: 8 %

Enovos does future contracts to ensure that it is able to provide a stable price to businesses. This situation gives no incentives to drive the "prosumer idea". Cheap electricity in Luxembourg discourages prosumerism. It is hard to make energy cheaper than the current price. In Germany the end-user price is much higher and it encourages more people to become prosumers. The current feed-in tariffs increase the cost of energy. It might be more efficient to encourage prosumerism rather than providing feed-in tariffs for feeding energy into the grid. Electricity prices are actually getting lower and lower on the wholesale market, but the price decrease doesn't reach the consumers, because of the taxes as well as the subsidies for renewable energies. There is an obligation to accept renewable energy into the market, which can sometimes push out some fossil-based capacity, notably gas turbines, which have the technical attribute of being able to be used very flexibly.

Consumers are mostly quite passive and only a very small percentage actually switch to alternative suppliers. Therefore it is difficult to get competition on the market. This happens also because of the price structure, only roughly a third of the total electricity price being subject to competition (cf. above). There are no official statistics for the number of prosumers in Luxembourg, but according to the experts there are very few. It is crucial to activate the consumers in Luxembourg.

In countries with well-developed prosumer sectors, the financial benefits for households are much higher. In Italy, single family households with an annual consumption of 4,000 kWh can typically reach a 30% annual self-consumption rate from PV systems of 3.5 kWp, 3 kWp and 2.75 kWp capacity in the North, Centre and South of Italy respectively. This constitutes a saving of about €720 per year on their electricity bill (with a pay-back period of about 7-9 years, depending on the region) (COM/2015/336). In Germany, by installing a 4 kWp PV system, a typical single family household with an average annual electricity consumption of 3,600 kWh could save almost €680 each year, of which approximately: €320 from self-consuming 30% of the electricity produced on site, with an additional €360 from the selling of surplus electricity into the grid (COM/2015/336).

There is a rapid decrease in the cost of PV installations. Some countries, such as Germany or Italy, have already eliminated the premium feed-in tariffs and value the self-consumed electricity at the retail price. In the UK, PV systems below 30 kWp receive a generation tariff for the PV production that is self-consumed and also a bonus for the excess electricity fed into the grid.

The renewable electricity that is self-consumed is exempted from grid costs and other system charges in some EU Member States, especially when such electricity remains within the customer's premises without entering the public network. However if the generated electricity is not self-consumed during peak hours, Distributed System Operators' (DSO) costs may not decrease, because they are driven by the peak capacity (COM/2015/336). The peak capacity (or the peak power at connection point and grid segment levels) is the main driver for infrastructure investments by DSOs in order to secure constant energy provision and suitable network technical parameters. There is the risk that a large-scale deployment of self-consumption could impact the remuneration of DSOs and have a negative impact on the electricity tariffs of other consumers. In Luxembourg the main grid operator is Creos, which does not encourage the injection into the network of self-generated electricity. The current structure of the grid does not meet the smart grid criteria.

The Institut Luxembourgeois de Régulation (ILR) believes that the prosumer only should pay for the energy he takes from the grid. The grid should not be used like a "battery". When after 15 years guarantee feed-in-tariffs are over it is possible that the renewable energy producers might want to consume your own energy. In such situation they should be charge for difference between what comes into the house and what goes out of the house. Prosumer would only pay for what goes into the house, nevertheless ILR wants to take account of the intermittence of the power generation equipment, such producers should not only be given all the benefit, if they take "peak load" out of the grid. Therefore, a specific component in the grid fees should be foreseen for the prosumer with grid services, for those who don't have a battery.

Barriers for development of prosumers idea in Luxembourg:

- Grid design and grid operator's policies,
- Lack of regulation ("grey zone"),
- Technology: local storage systems, e.g. batteries, metering techniques and smart electrical appliances,
- Lack of incentives, because of relatively low electricity prices & feed-in-tariffs for feeding energy into the grid,
- Relatively high costs of renewable energy production.

Prosumerism can be done on the single family or single household level, but from an energy democratising perspective, the collective basis is more applicable. We consider that prosumerism in the collective form offers a good model for local social enterprises.

The social enterprise can prepare the way for social learning in the broader framework and lead to different kinds of renewable energy production and consumption. As a result it can change the paradigm in sustainable development (major social innovation). Energy usage patterns and habits can thus be changed towards more sustainable ones.

Renewable energy generation makes the people involved more aware of energy consumption patterns. Prosumerism brings this to the next level. The potential for renewable energy production already exists in Luxembourg, but the challenge is to scale it up to a broader group of people. In the urban areas in particular, there is a need for new solutions involving for example all of the tenants or at least the majority of tenants. Apartment blocks offer considerable potential for developing collective energy production and self-consumption. So far this potential is completely under-exploited in Luxembourg.

The existing energy cooperatives make it easier to reduce the barrier to entry to renewable energy generation by sharing the cost of the infrastructure investments and sharing the know-how (the members do not need technical knowledge to generate the renewable energy). In the case of an apartment building the renewable energy generation systems can become part of the building infrastructure, as for example water pipes are today, so the barrier to entry will be further lowered. This will encourage the further development of local renewable energy generation and consumption.

New regulations aim to change feed-in tariffs for cooperatives and to offer subsidies to cooperatives for investments. However, the proposed new draft law is still under discussion. The market should be more open for more players, particularly small producers and prosumers – and new regulations offer this - because the compensation fund is running out of money. Contributions to the compensation fund are increasing. The number of cooperatives and collective producers should increase after the new regulations enter into force. It can be assumed that numbers of prosumers

will increase, but only in the longer term. The present legal aspects are putting prosumers into the "grey zone".

The revolution would be if a cooperative were to take over part of the grid. Smart grids might help towards "professionalisation" of renewable energy provision, getting to broader issues of participation, democracy and participatory democracy.

The challenge is to ensure that the future instruments that are aimed at promoting renewable energy production do not lead to over-compensation and thus discourage the development of prosumerism. The new model of self-consumption should integrate variable renewable energy sources, while promoting energy security, efficiency and decarbonisation.

### 5.1.2 Benchmarking - Prosumerism Examples from Germany

With its nearly 1,000 energy cooperatives, the cooperative landscape in Germany is one of the most dynamic in Europe. However, while there is a civic alliance advocating the "Right to Self-Supply" ("Recht auf Selbstversorgung") led by an energy cooperative, EnergieGenossenschaft Murrhardt, there are but few examples of steps towards collective prosumerism. Although few in numbers, they still show potential paths and models for how to take energy democratisation, professionalisation and diversification to the next level.

**Energy cooperative Heidelberg – turning apartment buildings into (potential) prosumer units**

As the first cooperative in Germany, the Heidelberger EnergieGenossenschaft (HEG) has teamed up with a local cooperative building society to turn buildings of rented flats into prosumer units by installing solar panels on the roofs (project "Neue Heimat" Nussloch). The installations have a peak performance of 445,5 kilowatt, producing approximately 370,000 kWh electricity per year. This corresponds to the annual consumption of 100 households (families of four members). In cooperation with the green energy supplier Naturstrom (a public limited company with nearly 1,000, mostly small, shareholders), the energy cooperative sells the electricity directly to the tenants (direct marketing), offering them lower prices than other energy suppliers. Tenants can also become members and invest in the cooperative (see www.heidelberger-energiegenossenschaft.de), in which case they become prosumers.

Source: www.heidelberger-energiegenossenschaft.de

**Schönau: Green energy and grid operation in the Black Forest**

After ten years of efforts, citizens from the anti-nuclear-movement, organised as the energy cooperative "Netzkauf" (grid purchase), bought the local electricity grid from the city of Schönau in 1996. This became possible after a local referendum was organised and 1 million EUR were raised in a Germany-wide grassroots-campaign and via the creation of a limited liability company. Since the 1990s, the cooperative has gradually expanded its activities, setting up and owning 100% of four limited liability companies (Elektrizitätswerke Schönau Netze GmbH, EWS Vertriebs GmbH, EWS Direkt GmbH and EWS Energie GmbH). Via these companies, the cooperative now operates several electricity and gas grids in its region, sells electricity (and gas) from renewable sources directly to consumers, both locally and nation-wide (150,000 customers throughout Germany), and supports renewable energy installations (with a very high proportion of solar energy). Thereby, inhabitants in Schönau have the opportunity to produce, sell, buy and own renewable energy (mainly) in their own region and pay grid fees to a provider that is owned by a local cooperative. (Website: www.ews-schoenau.de)

### 5.1.3 Policy Recommendations concerning Prosumerism

Luxembourg's legislative and policy context is not currently very propitious for the development of the prosumer paradigm. The cooperative should thus seek to influence government policy in the following areas:

- Prosumers should only be required to pay grid fees (paying the grid operator for the infrastructure that delivers electricity) for power received through the grid, not for that power that they generate and use themselves.
- Administrative procedures for becoming a prosumer should be simplified to the maximum.
- It should be possible for local power suppliers to take over the operation of the grid in their locality.

- Financial incentives should be considered, e.g. subsidising the cost of specific energy consultancy, batteries, grid connections, large-scale renewable energy installations on and for apartment blocks built as prosumer units etc.
- Ways should be found for tenants to benefit from prosumer infrastructure, not just the owners of apartments.
- Real estate agencies, property-development agencies, construction companies, urban planning agencies, "communes" etc. building apartment blocks (of a certain size) and new urban districts should be required to consider installing renewable energy generation devices and building their projects as "prosumer" units – a written statement as justification required

## 5.2. Proposing a New Energy Cooperative: OurEnerCoop

In order to develop a new social enterprise, we applied the design thinking methodology and went thought the following stages to develop a new "prototype" (Brown, 2008; Brown & Wyatt , 2010):

1. Understand: context of renewable energy provision in Luxembourg & positioning cooperatives as a specific legal entity
2. Observe: two case-studies
3. Point of view: are energy cooperatives a suitable form for increasing and democratising renewable energy production?
4. Ideate: which collective forms will be most appropriate? What would need to be changed in terms of legislation, the energy market itself, etc.?
5. "Prototype?": alternative scenarios for collaborative renewable energy production.

### 5.2.1. Main Aspects of the "Prototype"

Establish a new social enterprise, OurEnerCoop, which takes the model of the existing Luxembourg energy cooperatives and extends it to take advantage of trends in the energy sector.

The membership should be as open as legislation allows, including private individuals, local government, NGOs, small local commercial companies, with little or no geographical limitation.

Existing Luxembourg energy cooperatives generate solar renewable energy locally using photovoltaic (PV) modules, generating revenue by selling the electricity generated against the advantageous feed-in tariffs (FITs) allowed by current legislation.

The new activities should continue to be based on solar power generation, but the business model adapted to future electricity market realities. This should include a clear move to prosumerism, meaning that OurEnerCoop should distribute the electricity generated to its members in the immediate locality (in the same or neighbouring buildings), thus reducing their bills for electricity provided through the grid. These members would buy the rest of their electricity through the grid in the traditional way; any surplus would be sold to the existing energy supplier, probably at market rates. It is important to ensure that the new energy cooperative model is providing enough income to be self-financing (see figure 13).

We propose that the basic prosumerism approach should initially be tested through a pilot project. This would probably involve installing an appropriately scaled PV array on a new medium-sized apartment block and inviting the families concerned to join the cooperative in return for the expectation of cheaper electricity bills.

A likely further development would be the provision of local electricity storage, probably in the form of

| **Key Activities: running an energy cooperative that:** | **Key Partners:** |
|---|---|
| • Produces and sells renewable energy<br>• Sets up prosumer units in own community (public buildings, new houses and apartment blocks to be built in partnership)<br>• Offers consultancy services: to other communes, real estate agencies and construction companies | • In the energy market: grid operator and electricity supplier (our customer)<br>• Our commune and policy-makers<br>• NGOs (non-commercial)<br>• Commercial partners (clients paying for consultancy services)<br>• Energy certification consultancies<br>• Micro-finance institutions (for supporting cooperatives around the globe**)**<br>• Fonds de Logement<br>• Property developers<br>• Housing cooperatives |
| **Key resources & Value proposition**:<br>Renewable energy, Prosumer units,<br>Expertise on how to set up energy cooperatives and prosumer units | |
| **Cost structure:** | **Revenue streams:** |
| • At least one employee running the cooperative and consultancy services<br>• Technical installations and their maintenance<br>• Storage system, battery | • Contributions from members (shares)<br>• Feed-in-tariffs (surplus power)<br>• Selling (surplus) electricity to ENOVOS<br>• Selling electricity (cheaper) to people living in the prosumer units<br>• Fees paid by clients for consultancy<br>• External grant financing of the projects (EU funds, funds in Luxembourg) |

Figure 13 Simplified business model of OurEnerCoop

In the medium term OurEnerCoop should look for opportunities to export this technology to developing countries, offering to support PV and battery installations on a cost-covering (i.e. non-profit) basis in places where there has previously been no power supply. The financing of such projects should involve local microfinance institutions where possible. The cooperative should provide technical and project management skills and help with the supply of equipment. OurEnerCoop would expect to obtain support from the very strong microfinance network in Luxembourg in identifying suitable locations and partner organisations in the developing countries.

If successful the concept should be extended. We propose, in partnership with property-development companies, to build the prosumer infrastructure into new apartment buildings from the start, such that buying an apartment would automatically imply buying into the prosumer model.

The business model needs to be prepared in more detail, particularly concerning the costs and revenue streams. OurEnerCoop aims to be financially self-sustaining. It should sell consultancy on electrical energy provision as well as selling the electricity itself. The speed with which this model can be adopted depends on the future cost trends of PV modules and, perhaps even more, of battery storage devices.

**Analysis of Strengths, Weaknesses, Opportunities and Threats**

Figure 14 presents the SWOT analysis for the proposed new social enterprise OurEnerCoop.

| Strengths (internal) | Weaknesses (internal) |
|---|---|
| • Open and democratic structure of membership, encouraging the citizens to collaborate together.<br>• Clearly defined social, environmental and financial goals, which are attractive for members.<br>• Multiple revenue streams, increasing the financial stability of the project.<br>• Financial benefits for members (cheaper energy).<br>• Minimal entry barrier because the infrastructure is provided by the developer and the know-how is also already available.<br>• Bigger scale of the renewable energy project (easy replicable business model for upscaling) compared with the single-household prosumerism | • Cooperative is treated as a commercial enterprise, so there are administrative and financial obligations, which are costly and time consuming to fulfil.<br>• Only one energy source (Photovoltaic)<br>• Depending on the tenants' participation, in a medium size apartment block, there might be a lot of tenants who only rent the flat for a limited period of time, so rules for participation should be very clearly defined (e.g. what happens when a tenant terminates his lease and a new tenant arrives).<br>• More difficult peak consumption management because of number of independent tenant with different consumption patterns. |
| **Opportunities (external)** | **Threats (external)** |
| • Decreasing investments cost of the renewable energy systems.<br>• Pressure put by the EU policy to increase renewable energy share in Luxembourg.<br>• Increasing availability of new and cheaper storing technologies, which encourages decentralised storage of excess energy<br>• Increasing citizens' awareness regarding environmental problems caused by fossil fuels<br>• Good political climate for development of prosumerism in Luxembourg (Rifkin's 3rd Industrial Revolution strategy for Luxembourg) | • Lack of simple accessible tools and administration procedures for notification of the grid access to inject the excess energy.<br>• Existing structure of feed-in tariffs (over-compensation).<br>• Discriminatory charges for self-consumption imposed by the grid operator.<br>• Energy price structure in Luxembourg (relatively cheap energy) |

Figure 14 SWOT analysis for the new social enterprise

If the model is successful, it may be appropriate to consider moving from a cooperative to a more commercial organisation structure, or spinning off part of the organisation into a commercial operation. In either case, the social objectives should be maintained.

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