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## Introduction: The Challenge of Achieving the Energy Transition

Jens Lowitzsch

Renewable energy (RE) has made considerable progress in the last 25 years. Its percentage share of total energy production in the EU-28 between 2005 and 2015 grew from 8.7 to 16.7 per cent,<sup>1</sup> closing in on the 20 per cent goal set by the 2020 Climate and Energy framework. Reducing greenhouse gas by 20 per cent also seems attainable.<sup>2</sup> Similar progress in lessening the effects of global warming is taking place in other parts of the world although the key drivers and priorities are diverse. The ambitious objectives of the EU together with the bold steps taken by some Member States have prepared the ground for shifting to an energy supply that is competitive, sustainable and secure. Financing investments in renewable energy sources (RES), however, remains key to achieving

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<sup>1</sup> <https://publications.europa.eu/en/publication-detail/-/publication/2e046bd0-b542-11e7-837e-01aa75ed71a1/language-en/format-PDF/source-search>; EU energy in figures, 2017.

<sup>2</sup> <http://www.eea.europa.eu/media/newsreleases/policies-put-the-eu-on>.

J. Lowitzsch (✉)

European University Viadrina, Frankfurt (Oder), Germany

e-mail: [lowitzsch@europa-uni.de](mailto:lowitzsch@europa-uni.de)

the 2030 and 2050 goals of a low-carbon economy with increased energy efficiency. Switching energy systems from fossil fuels to RES requires financial, technical and social innovation. A new energy infrastructure must be built and individuals must be motivated to adopt flexible consumption habits to match demand with the supply of volatile energy sources.

The development and market rollout of innovative financing schemes for sustainable energy are also necessary to attain the EU-wide target of at least 27 per cent<sup>3</sup> renewable energy consumption by 2030, as well as for the success of the new energy policy generally. Other nations have announced similar targets. China, for example, aspires to meet 15 per cent of primary energy demand with renewables by 2020 and 30 per cent by 2030. But these goals confront the same financing challenge. In a market historically dominated by large suppliers heavily invested in fossil fuels, citizens investing in RES have become a new category of market participants and an important impetus for meeting this challenge. For example, in Germany, a pioneer in renewables, more than 40 per cent of the installed renewable power capacity was owned by private citizens at the end of 2016 (trend:research 2016). As more and more renewable energy technologies (RETs) reach grid parity, a growing number of citizens will become *prosumers*,<sup>4</sup> that is, producers of the energy that they consume.

At the same time, however, legislative conditions across the EU and worldwide which have so far limited financial risk and facilitated repayment of bank loans for RES installations have become less favourable; the change from guaranteed feed-in tariffs (FITs) to auction models especially is inclined to discourage individual commitment because they favour large-scale projects that can diversify risks through broad project portfolios. Simultaneously, politics is discovering the

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<sup>3</sup> Or even 32 per cent if the provisional agreement reached between the European Parliament and Council on 14 June 2018 is confirmed by the official co-decision procedure after the summer break (Euractiv et al. 2018).

<sup>4</sup> As early as 1972, Marshall McLuhan and Barrington Nevitt suggested in their book *Take Today* (p. 4) that technological progress would transform the consumer into a producer of electricity. The artificial word stemming from the Latin was probably first introduced by Alvin Toffler in his book *The Third Wave* (1980).

consumer to be a vital market player whose behaviour—whether as co-producer, self-consumer or investor—is crucial not only to energy efficiency but to acceptance of new RE installations and other new technologies, for example, smart meters.<sup>5</sup> Educating and motivating individual consumer households to accept sustainable energy and their personal role in energy markets depends in part on the motivational power of ownership of RE installations be it at consumer premises or commercial production facilities. Although models for prosumership and consumer ownership in RES have made considerable progress in a few pioneering countries like Denmark and Germany, they are not yet widely implemented across Europe.

This raises the question of whether consumer ownership in RES is a transitory phenomenon or a necessary condition for transforming energy systems from fossil to renewable sources, in short, the energy transition. If a necessary condition, then how do we go about broadening participation? Is consumer ownership of RE production facilities merely politically desirable to satisfy expectations of participation arising from a concern for distributive justice or simply from expediency, that is, to make infrastructure projects publicly acceptable? Or do sound economic arguments exist for broad public ownership in RES, arguments related to the structural differences between renewables and fossils on which the success of the energy transition depends?

## 1.1 Background: Reorganising Energy Production and Ownership in RES

In many countries the energy transition goes along with decentralised, small-scale RETs which are changing the energy supply infrastructure (Arnold and Yildiz 2015). The most common energy production facilities

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<sup>5</sup>See, for example, the Commission Communication “Delivering a New Deal for Energy Consumers” (COM(2015) 339 final) stemming from the “summer package” of July 2015, focusing on energy efficiency, electricity market design, consumers and the Emission Trading System; furthermore, the EU “winter package” emphasising the role of energy security, intergovernmental agreements, gas infrastructure and a heating and cooling strategy.

are small- and medium-scale wind farms, solar and bioenergy projects. Wind and solar power are particularly suitable for schemes involving citizen participation, as the underlying technology, and thus the energy generation process, is not as complex as in bioenergy structures. The size and mix of the installed distributed generation capacity will depend on the relative costs and benefits of the specific technology (Pepermans et al. 2005). It is interesting that neither traditional finance schemes nor large investors are as relevant for RE as one might expect because of two factors which favour individual ownership participation schemes in RES:

- Established energy companies and other related technologies and networks are “locked in” to fossil fuel-based infrastructures (Unruh 2000) because of their heavy financial commitments and the relatively low risk-return ratios of RE projects (Arnold and Yildiz 2015).
- In comparison, RE projects with substantial citizen ownership do not need to concern themselves with worry about shareholder value and quarterly profit reports; they also lack the financial resources to take on large projects and thus are more likely to accept the relatively high capital costs per kW of installed power compared to large central plants (IEA 2002).<sup>6</sup>

### 1.1.1 The Financing Gap and Consumer Financial Participation

In order to limit global warming to 2 °C and avoid the worst effects of climate change, it is estimated that the world needs to invest an additional USD 1 trillion per year through 2050 (Fulton and Capalino 2014). While the year 2015 saw global investment in the energy sector of approximately USD 1.8 trillion, a total of about USD 3.5 trillion would

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<sup>6</sup> Differences in capital costs between the different distributed generation technologies are also quite large, ranging from EUR 1000 per kW to over EUR 20,000 per kW for combustion turbines and fuel cells, respectively. The capital costs of large central plants, on the contrary, vary per kW from approximately EUR 800 for gas-fired plants to EUR 2500 for IGCC and EUR 6000 for nuclear plants (Schröder et al. 2013).

be required each year from 2016 through 2050.<sup>7</sup> Local authorities in charge of energy efficiency and climate policy with limited budgets often lack means to initiate new and innovative projects.

Closing the financing gap becomes even more important since investments in RE are an important driver of economic development and employment. A Commission study (European Commission 2014)<sup>8</sup> finds that “new industries with a strong lead market potential have been created, which contribute a value added of about EUR 94 billion or about 0.7 per cent of the total GDP and an increase in total employment of about 2 million, that is, about 0.9 per cent of the total workforce in Europe in 2011”. RES investments would positively impact job generation (EC Expert Group 2016; Lehr et al. 2008; critical though Lambert and Silva 2012 and Böhringer et al. 2013). Different types of power plants require different installation and maintenance schedules. For example, a wind energy power plant requires intensive work during the installation period, construction, network connection and so on, but requires less maintenance than a photovoltaic plant which has to be cleaned frequently. The European Economic and Social Committee (EESC 2015) concludes that the growth in renewables brings about new jobs along its value chain “with this job generation effect being particularly high in the sectors of energy efficiency (0.38 job-years/GWh), PV (0.87), biofuels (0.21) and wind (0.17) when compared to coal and gas (0.11)”.

***Prevalent business models***—Present business models which fund RE investments of private individuals fall into two categories (Holstenkamp et al. 2017):

1. Genuine, more egalitarian ownership schemes, for example, energy cooperatives, that typically are small- or medium-sized projects confronting the problem of being “sub-scale” investments.<sup>9</sup>

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<sup>7</sup>At the same time the decline in fossil fuel investment would be largely offset by a 150 per cent increase in RES investments between 2015 and 2050; IRENA estimates that total demand-side investments in low-carbon technologies would need to surge by a factor of ten over the same period (IRENA 2017; IRENA 2014).

<sup>8</sup>The gross value added of the RES sector may increase to about EUR 100 (120) billion and employment in the RES sector would amount to 1.6 (2.1) million persons by 2030 if a target of 30 per cent (35 per cent) in terms of the gross final energy is implemented.

<sup>9</sup>That is, optimisation of the size of technical installation, for example, a 100 kW “citizen wind turbine”, is not economically sound; scalable financing techniques on the other hand would help

2. Profit-oriented, market-centred investment schemes such as closed-end funds that attract money for large-scale projects but do not permit investor participation in decision-making.

If RE projects are to be combined with active citizen participation, both financially and in decision-making, new models must be innovated. The question is how do we retain the benefits of individual consumer participation when advancing to economies of scale while simultaneously including low-income households? Support for business models that facilitate consumer ownership in RES must first level the playing field; the objective is “equality of arms”. If investments in RE at the local/regional level are to succeed in an environment of regulatory conditions which favour large investments, that is, the worldwide trend towards direct marketing and auction models, consumer ownership models must be able to coexist with their competing commercial counterparts. This is ever more important in the light of the rent-seeking behaviour of large investors—often heavily invested in fossil fuels—aiming at securing advantages of their established market position and thus profits regardless of increasing cost efficiency.

***Stakeholder involvement and financial participation***—Financial participation has a complex relationship with participation in decision-making and stakeholder involvement in general. In addition to helping to close the financing gap, the involvement of all stakeholders is now recognised as crucial to the success of policies responding to climate change, including the shift to green energy. Participation can take diverse forms and occur at different stages of project implementation: (1) information about the ongoing development, (2) participation in decision-making during the planning process and (3) financial participation in the project. While the first two forms of participation involve all stakeholders, the last one is reserved to shareholders. In addition to the obvious benefits of engaging citizens in decision-making during the planning phase (Devine-Wright 2005), financial participation in the project itself

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small investors pool their investment, boost it with leverage and build a more efficient standard industrial 1.2 MW wind turbine.

has material benefits, namely, the right to share in the investment profits. With regard to participation in decision-making, the involvement of citizens as consumers that become (co-)owners can take either of two forms:

- *Passive financial participation* which involves no role in decision-making and where investment return is the principal objective (e.g. bonds, loans, silent partnerships and limited partnerships)
- *Active financial participation*, where citizens-owners also assume a role in the governance of the utility (e.g. coops, limited liability companies and partnerships)

While financial participation in general may provide consumers with the incentive for maximum involvement, active direct participation, including voting rights, provides shareholders with the power to exercise it. The literature defines these two types of financial participation as citizen/consumer participation in a *broad*er, that is, passive sense, and a *narrow*er, that is, active sense (Yildiz 2014; Holstenkamp and Degenhart 2013).

### 1.1.2 Defining Consumer Ownership

In this book we use the term “consumer ownership” and in some instances “consumer (co-)ownership”<sup>10</sup> for *all participation schemes that (1) confer ownership rights in RE projects (2) to consumers (3) in a local or regional area*.<sup>11</sup> Our definition refers to participation in the narrower sense, that is, financial participation combined with some degree of participation in decision-making in an enterprise located in a specific geographic area

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<sup>10</sup> The notion of (co-)ownership is used here not in the technical sense of joint ownership but to indicate that there may be other owners next to the consumers amongst the shareholders such as municipalities or conventional investors.

<sup>11</sup> A related definition of a project as community power is that of the World Wind Energy Association (WWEA) requiring at least two of the following three criteria: (1) local stakeholders own the majority or the whole project, (2) voting control rests with the community-based organisation, (3) the majority of social and economic benefits are distributed locally; available at: <http://www.windea.org/communitypowerdefinition/>.

where the consumer lives; the term may also apply to the involvement of municipalities and/or commercial investors, both important in practice but often difficult to combine. A comprehensive definition of citizen financial participation in RE does not yet exist inasmuch as forms vary greatly from country to country.<sup>12</sup> In accord with the above criteria, the term *consumer ownership* may embrace a wide variety of participation models from different categories, depending on specific characteristics. In our discussion of an ownership-oriented approach, we address the participation models practised in the countries under consideration as they relate to consumer ownership. However, the three core elements of our definition may not be present in every case:

- Schemes summed up under *citizen energy*, also referred to as *energy citizenship*,<sup>13</sup> for example, typically will involve consumer ownership while these schemes are not necessarily local/regional.
- While *community energy/community power* models represent locality and common interest of resident consumers,<sup>14</sup> they may not include individual ownership rights, in particular voting rights; they may, however, involve other participatory mechanisms such as decision-making at the local level.
- The *prosumer*, that is, a consumer who (co-)produces the goods or services he consumes, is not necessarily an individual but may be a micro enterprise or an SME; furthermore, this term would not apply to situations where direct self-consumption is not feasible.

Consumer ownership thus intersects with “citizen energy”, “prosumership” and “community energy” (see Fig. 1.1), while national schemes summarised under one of these descriptions may include some

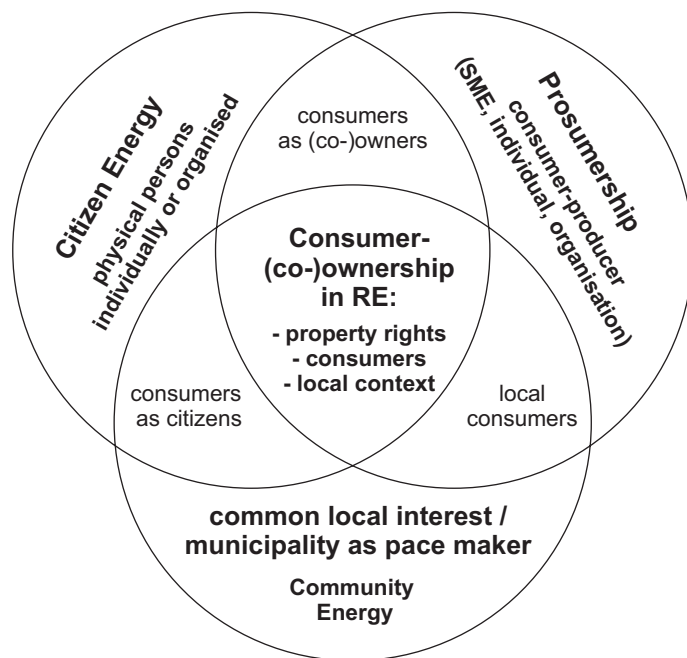
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<sup>12</sup> Definitions in the literature often refer to unique national concepts shaped by historical development and their corresponding business models (e.g. Walker and Simcock 2012) or stem from technological, economic and political characteristics (cf. Radtke 2016, p. 174).

<sup>13</sup> The term “citizen” in this context encompasses both natural persons individually and organised, for example, civil society groups, social entrepreneurs, schools, micro enterprises, faith groups.

<sup>14</sup> See Holstenkamp and Degenhart (2013); commonly used in Anglo-American countries and in particular in the UK, this term stresses the participation of local authorities, government departments and utility companies (REN 21 2016; Walker and Devine-Wright 2008).





**Fig. 1.1** Consumer ownership in RE and its relationship to citizen energy, prosumership and community energy

key elements of our definition but not all. The umbrella term used for all cases presented in this book involving one of these three participatory approaches is RE communities (see Chaps. 6, 28 and 30).

Distinguishing consumer ownership from conventional forms of investment begins with the question of who initiates the project and who its immediate beneficiaries are (Walker and Devin-Wright 2008). Secondly, is it collective or individual (Radtke 2016; REN21 2016)? We also discuss broader concepts related to this ownership-oriented approach. For example, “energy democracy” implies equality of access to an adequate supply of affordable green energy and *democratic ownership of production facilities* (Morris and Jungjohann 2016; Becker and Kunze 2014). In these cases which may not involve individual ownership, we discuss the schemes’ features from an ownership perspective in order to determine compatibility and pathways for further development.

### 1.1.3 Determining Factors for Different Ownership and Participation Models

In the 18 country studies presented in this volume (see Part III, Section 4.3 of each chapter) we find a wide variety of models featuring different combinations of organisational and contractual arrangements, identities and interests. Each of these factors influences the size, type and implementation of a consumer (co-)owned RE project; it is their combination in a particular setting, however, that limits or supports success. This interdependency, together with the geographic and cultural diversity of the cases under consideration, is too complex for “one size fits all” solutions even within a given country. While “identity” and “interest” are deeply rooted in geography and culture, the underlying business models, understood as organisational and contractual arrangements, depend on policy and procedure and thus can adapt to the former. Adopting a sociological approach Chapter 28, groups the mentioned key factors around two notions, namely, communities of place and communities of interest as well as their intersection to identify patterns of success or failure. This chapter also provides an overview of all the best practice projects presented in this book.

Both “place”, used here as a synonym for “identity”, and “interest”, meaning “common interest”, strongly influence the design of successful RE consumer ownership models. Another related dimension, namely, energy justice, must also be taken into account. The main question here is how to structure the energy transition as a level playing field so that all citizens have the same opportunity to acquire an ownership stake in RES. Energy justice recognises that the different groups in society confront different barriers to consumer ownership ranging from cultural tradition over economic opportunity to the geographic situation (see Sect. 1.5 of the country chapters). Energy justice requires that the approach chosen be elastic. It is their contractual and organisational arrangements that link business models to the larger social issues of energy democracy and distributive and social justice. Not only location, rural or metropolitan, but attitudes, motivations and differences in economic status that affect the ability to acquire ownership in RE installations within a given community as well as the relationship with strategic partners must be taken into consideration. Trusteed plans like the Consumer Stock Ownership Plan (CSOP) allow participating consumers to speak with one voice vis-à-vis other shareholders such as

a municipality or a commercial investor after an internal decision-making process supported by a professional trustee (see Sect. 1.2.3.).

An important aspect of distributional justice and inclusion finally involves the ability of socially disadvantaged groups to make sound economic decisions. Vulnerable consumers living on the margins of society are typically affected by energy poverty. Their attention is often so distracted by worries over how to make ends meet that they can seem disinterested in the energy transition and their meaningful participation in RE. However, it is often their ability to assess the benefits which may be impaired by the scarcity they live in (Mullainathan and Shafir 2013). For economically disadvantaged consumers, questions of energy efficiency or RE ownership will typically be secondary to more immediate problems such as adequate housing, food, health, education or childcare. These short-term needs pre-empt attention from long-term issues such as acquiring RE ownership. But besides energy-impooverished households women are also underrepresented, a phenomenon linked to economic equality of opportunity but also to other factors (see Chap. 3); empowering them to participate in RE projects is equally important.

This situation has implications for who is perceived to be a potential owner and how to engage with them—issues which not only touch upon justice as recognition but also procedural justice. Becoming an owner of a RE installation may require a period of apprenticeship, especially when complex technical issues are involved or the opportunities of participation are unequal because of educational and economic differences. In this context, trustee plans like the CSOP will level the playing field and provide disadvantaged groups with genuine equality of opportunity. These issues are discussed in depth in Chapter 4.

## 1.2 The Potential of Consumer Stock Ownership Plans to Meet the Challenge of Consumer Ownership

To harness the potential of citizens' investments in RES and preserve its dynamic in a changing regulatory environment requires innovative solutions—solutions based on conventional best practice but which include all strata of society and meet the needs of retail investors. Best practice

models presently implemented across the EU such as energy cooperatives and limited partnerships can be adapted to these purposes and updated to include municipalities and/or commercial investors. Advancing and developing successful models is particularly important as they differ in some respects from traditional commercial models. Cooperatives, for example, make less suitable partners for municipalities or commercial investors (see Chap. 7), while limited partnerships lack both participation in decision-making of shareholders and local involvement of stakeholders (see Chap. 6). Neither of these conventional models combines the potential for scalable investments with direct consumer participation—both important prerequisites for decentralised RE production.

### 1.2.1 Changes in Subsidies and Incentive Systems

The efficient integration of distributed energy generation in the electricity market depends on market structure, pricing mechanisms and available subsidies (Pepermans et al. 2005). In many countries, the structure of the electricity market is currently undergoing significant change with transition from guaranteed FITs to auction models, the most apparent trend. Under the auction model, installed capacity or electricity production is determined through tenders organised by public institutions. This procedure usually takes the form of a so-called reverse auction (Fürstenwerth et al. 2014). Unlike conventional auctions where an increase in bids to buy drives prices up, in RE auctions bids to sell cause prices to fall. Thus the lowest-price bidder wins the tender and is typically rewarded with a FIT or feed-in premium (FIP) for a specific period of time.

Tender systems, whether applying to all RE technologies or differentiating between them, were introduced in many countries as an alternative or addition to existing FITs and FIPs (IRENA 2013). Tendering the installed capacity (in kilowatts) rather than generated electricity (in kilowatt-hours) is technology-dependent and thus serves as a benchmark for project developers and investors; the downside is that it does not allow electricity generation to be exactly predicted. Although one of the main goals of a tender system is to facilitate and control the expansion of RE

infrastructure, bidders, in order to win a tender, may provide an idealised version of their proposal. Consequently, a winning bid sometimes cannot be implemented because of difficulties or delays arising from omissions in the original presentation. Thus the remuneration awarded may not cover the actual expense. “Underbidding” may result in unfulfilled expansion goals. Economies of scale generally favour large projects and deep-pocket bidders rather than small projects of limited potential in either installed capacity or generated electricity with a possible discounted price (Richter 2012; Fürstenwerth et al. 2014).

Tender systems involve investor risk. Additional capital or bank guarantees may be required. These uncertainties can discourage private investors and small enterprises in particular. As an example, despite the fact that citizen participation is regarded as important to the success of Germany’s energy transition, experts warn that the tendering system may discourage small-scale investment (Fürstenwerth et al. 2014). One idea for correcting this problem would be to provide preferential conditions in the tenders for local agents, such as municipalities, SMEs, energy cooperatives or private citizens. Investment risk and capital requirements could be limited, for example, by reducing pre-qualification requirements and potential fines.

### **1.2.2 Market Integration of RE: What Role for Prosumers and Local Small-Scale Generation?**

Market integration of RES aims at creating competitive energy markets with renewables generally subject to normal market rules. This entails the question of how to align subsidies with normal market rules and how to provide a level playing field for all market participants (see preceding section). Here the ownership structure of the RE sector is crucial. The optimal market design will avoid both concentrated ownership in the hands of a few—an oligopoly detrimental to competition—and a fragmented market with a plethora of small players driving up transaction costs and impeding governance. The Spring 2018 negotiations between the European Commission, Parliament and Council (so-called Trilogue)

concerning the “Clean Energy Package”,<sup>15</sup> a bundle of legislative acts to further advance the Energy Union, are a good example of the policy challenges involved. While there seems to be consensus amongst policy makers to postulate a sufficiently large number of market participants to guarantee competition and prevent market domination by a few large players, there is disagreement about the degree of “actor diversity” necessary. At the root of this controversy lies the question of what constitutes a level playing field and particularly the question of whether or not small RE producers can coexist and compete with the large incumbent energy suppliers without regulatory support. This issue directly impacts the development prospects for (co-)owned consumer projects which are typically medium or small.

The European Council, on the one side, stressed liberalisation of markets and was reluctant to grant any preferential conditions for small players as proposed above. The European Commission and the European Parliament (EP) in particular, on the other, favoured modest preferential conditions for prosumers and local small producers in order to ensure a level playing field. Above all the question of a “right to prosume” and the right to market generated energy directly (stipulated in Art. 21 of the recast of the Renewable Energy Directive (RED II)) as well as the framework to facilitate “renewable energy communities”—now aligned with the definition of local energy communities<sup>16</sup> (Art. 22 RED II)—were controversial (for more details see Chap. 31). On the one hand, the involvement of consumers as (co-)owners is inclined to facilitate their new role as active consumers which is key amongst others for demand flexibility (see Chap. 3). On the other hand, a disperse ownership structure, acknowledging the numerous actors on the RE markets and particularly the phenomenon of “Citizen Energy”, raises the problem of market fragmentation. With an expanding number of small units owned

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<sup>15</sup> The European Commission presented a *package* of measures on 30 November 2016 to keep the EU competitive as the clean energy transition changes global energy markets with four main goals, that is, putting energy efficiency first, achieving global leadership in RE, providing a fair deal for consumers and redesigning the internal electricity market.

<sup>16</sup> Local energy community as defined in Article 2 of the recast Directive on common rules for the internal market in electricity (2016/0380(COD)).

by individuals, governance, control and predictability of the market become increasingly complex and thus problematic.

Moreover, with increasing battery capacity accompanied by decreasing prices decentralised energy storage enabling the decoupling of electricity generation and consumption is a clear trend (see Chap. 29 on “prosumage”). Policy makers and regulators will seek to realise system-oriented integration of prosumage installations in order to tap their full flexibility potential for the power market. Here sector coupling, increasing electricity usage for heating and mobility purposes encompassing heat or hydrogen storages requires the interconnection both of the different actors as well as the various RES. This equally applies to smart grids and peer-to-peer marketing via new digital technologies like the blockchain which by enabling this interconnection of energy consumers and producers can be key to enabling an improved balance of electricity supply and demand in decentralized grid control (see Sect. 2.3.1 on smart grid technology). However, this requires substantial investments that in Western Europe alone are estimated to reach EUR 110 billion until 2027 (Northeast Group 2017).

Against the background of the RED II compromise reached in June 2018 confirming both fair conditions for self-consumption and collective local organisation thereof, one way out of this dilemma again is to innovate and deploy new organisational models for prosumership. Such contractual arrangements would allow pooling and scaling of RE investments (co-)owned by consumers while opening them up to various combinations of municipal or commercial investment, especially by SMEs. In particular as “renewable energy communities” (regulated in Art. 22 RED II) according to the legal definition in Art. 2 RED II require that local shareholders or members, that is, “natural persons, local authorities, including municipalities, or SMEs”, control them<sup>17</sup> they necessitate a multi-purpose corporate vehicle allowing joint investments by the various agents mentioned.

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<sup>17</sup> The RED II proposal of the European Commission and Parliament was even stronger requiring a minimum of 51 per cent ownership stake and corresponding control rights of these groups.

### 1.2.3 A Market-Based Financial Innovation: The CSOP

But how is consumer (co-)ownership to be achieved? How is the average low-income consumer to invest funds he may not have in an RE installation? How are consumers to become prosumers? That is a question conventional finance falls short to answer. Yet there is a financial innovation that was invented expressly for this purpose, the CSOP.<sup>18</sup> The CSOP as a low-threshold method of finance enables individuals to invest in an existing RE facility or invest to form a new one, large or small (Lowitzsch and Goebel 2013). Designed to facilitate scalable investments, it is open to co-investments by local partners such as municipalities or energy suppliers. In particular, poor citizens—who as a rule do not dispose of savings necessary for conventional investment schemes—are enabled to repay their share of the acquisition loan from the future earnings of the investment. This is how the CSOP works:

- A fiduciary trust set-up, for example, by the local community or a consumer organisation, to be managed by independent trustees, borrows funds to invest or acquire shares in a RE plant on behalf of participating energy consumers.
- The funds, often provided by a state bank under a specific programme to promote RE investments, for example, KfW's "Renewable Energy Standard", are channelled through a commercial bank.
- The funds are then invested and shares held by the trust on behalf of the CSOP consumer-beneficiaries and allocated in proportion to their individual energy purchases.
- Income earned by the shares minus depreciation is distributed to the CSOP and used to repay the acquisition loan.
- Once the debt is amortised, CSOP earnings are distributed as income to the consumer-beneficiaries.

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<sup>18</sup> The CSOP was applied with spectacular success in the USA by its innovator, Louis O. Kelso, a business and financial lawyer (see Chap. 8). It is related to Kelso's best-known financial innovation, the ESOP, which has enabled millions of American workers to become owners of their employer corporations, repaying the acquisition loan not from their wages but from the future earnings of their shares in the company. Today the ESOP is an integral part of American corporate finance. At the end of 2016 there were 6717 ESOP and 2898 ESOP-like plans in the USA, with about 14 million employees participating, that is, 13 per cent of private sector employees holding around USD 1.3 trillion in assets (NCEO [n.d.](#)).



Under continental law, a financing structure employing two limited liability companies—one an operating entity and one a trust—allows to pool individual investments while benefiting from the borrowing power of the corporation. Individual citizen participants are exempt from liability. The consumers acquire, in addition to access to cheaper energy, an additional source of income from their indirect share ownership. The trust is a separate intermediary entity which manages the shares held in trust for the consumer-beneficiaries and pools voting rights executed by the trustee, implying a due “professionalisation” of management: participation in decision-making is channelled through the trustee; individual consumer-shareholders may execute control rights as members of a supervisory board or an advisory council. The CSOP has an additional advantage: municipalities or external investors may invest in the project while being guaranteed voting rights proportional to their capital investment (Lowitzsch 2017). Together with the potential of scalability being compatible with conventional investments gives the CSOP the advantage to avoid concerns of market fragmentation (see Sect. 1.2.2 and Chap. 31): sub-scale investments can be avoided, local projects pooled and partnerships with municipalities set up, thus advancing to economies of scale while retaining the benefits of individual consumer participation.

Specific features of the CSOP approach for financing consumer ownership in RES, which explain its potential to both modernise and adapt best practice models for RES objectives, are discussed in Chapter 8 with a model calculation illustrating the life cycle of a CSOP in Chapter 9.

## 1.3 Political Setting in the EU and Potential Barriers

In 2015 the European Commission issued two Communications<sup>19</sup>: “Delivering a New Deal for Energy Consumers” and “On a New Energy Market Design”. Their message was that the three pillars of future consumer energy policy would be consumer empowerment, smart homes and networks, as well as data management and protection. The

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<sup>19</sup> COM(2015) 339 final and COM(2015) 340 final both of 15 July 2015.

Commission explicitly emphasises the role of *prosumers*<sup>20</sup> and thus advocates for both reducing energy costs through self-generation and consumption,<sup>21</sup> and expanding the consumer role through intermediation and collective participation schemes.<sup>22</sup> The EESC further issued two initiative opinions (TEN 578 and TEN 577) which strongly advocate the “prosumer approach”. The ITRE committee of the EP is taking considerable interest in these issues and took a positive stand when tabling amendments to the Commission proposal of the RED II (discussed in Sect. 1.2.2). The RED II sections on self-consumption and collective local organisation thereof as proposed by the EU Parliament and the Commission asked Member States to “provide a more conducive investment environment for self-generation and self-consumption” and “to suppress administrative and market barriers to new self-generation capacity, to replace lengthy authorisation procedures with a simple notification requirement and to put in place efficient one-stop shops”. However, Member States like Germany have been reluctant to support this approach in the European Council perceiving consumer ownership, be it individual or collective, more as an obstacle to market integration than as a lever to achieve the energy transition.

Nevertheless, after long-lasting and controversial negotiations, the outcome of the Trilogue on the Clean Energy Package (see also Sect. 1.2.2) confirms the prominent role prosumers and their local collective organisations will have across the EU in the future. Recital (54) of RED II thus states:

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<sup>20</sup> See in particular “Best practices on Renewable Energy Self-consumption” (SWD(2015) 141 final), accompanying document to the Commission Communication “Delivering a New Deal for Energy Consumers” (COM(2015) 339 final).

<sup>21</sup> See COM(2015) 339 final p. 6, (c) *Reducing energy bills through self-generation and consumption*: “Decentralised renewable energy generation, whether used by consumers for their own use or supplied to the system, can usefully complement centralised generation sources. Where self-consumption exhibits a good match between production and load, it can help reducing grid losses and congestion, saving network costs in the long-term that would otherwise have to be paid by consumers”.

<sup>22</sup> See COM(2015) 339 final p. 6, (d) *Increasing consumer participation through intermediation and collective schemes*: “Collective schemes and community initiatives have been emerging with increasing frequency in a number of Member States. More and more consumers engage in collective self-generation and cooperative schemes to better manage their energy consumption. This innovation by consumers is also resulting in innovation for consumers and opens up new business models”.

The participation of local citizens and local authorities in renewable energy projects through renewable energy communities has resulted in substantial added value in terms of local acceptance of renewable energy and access to additional private capital which results in local investment, more choice for consumers and greater participation by citizens in the energy transition. This local involvement will be all the more crucial in a context of increasing renewable energy capacity in the future. Measures to allow renewable energy communities to compete on an equal footing with other producers also aim to increase local citizen participation in renewable energy projects and therefore increase acceptance for renewable energies.

Furthermore, Art. 2 RED II defines three categories of actors that benefit from preferential conditions with regard to market access and authorisation procedures, namely, “renewable self-consumers” and “jointly acting renewable self-consumers” (both regulated in Art. 21 RED II) as well as “renewable energy communities” (see Art. 22 RED II). The introduction of jointly acting prosumers is a major step ahead with regard to tenant energy projects that empower in particular low-income households that typically rent their home and do not own real estate with the same “right to prosume”. When transposing, the RED II Member States shall thus ensure that prosumers, individually or through aggregators, are entitled to generate and store RE as well as to sell excess production to the grid at a market-based fair remuneration without being subject to discriminatory charges and—with regard to electricity that remains in their premises—any charges or fees. However, the Internal Electricity Market Regulation (IEMR) and Directive (IEMD) still in negotiation between the European Commission, Parliament and Council as of September 2018 will define a large part of the concrete market rules applicable (see Sect. 30.2). The legislative schedule foresees the IEM Trilogue negotiation to be closed until the end of 2018 and the adoption of the whole legislative package before the European elections in May 2019. After that, Member States will still have some room for manoeuvre in the transposition of the directives 18 months after their entry in force, that is, by the end of 2020.

As to political and communication barriers to consumer ownership, we believe that the political climate which previously hindered implementation

of new business models, like the CSOP, has now improved because of the structural particulars of the RE market. Measures necessary for decentralising energy production, such as planning designation or grid extensions, are more likely to gain acceptance when participants from the society at large are involved. Not only have policy makers changed their attitude, but the renewables industry and even large energy suppliers are more receptive to consumer (co-)ownership, regarding it beneficial to the implementation of local supply concepts and smart grids.<sup>23</sup> Also, broad consumer ownership in RE projects actually increases investment opportunities for the entire RE sector. Consumer-owned projects do not compete with or replace other investors. Instead, consumer ownership expands the society's renewable capacity. Barriers to consumer ownership are discussed in Sect. 1.5 of the individual country studies in Part III.

## 1.4 Consumer (Co-)Ownership, a Prerequisite for Energy Transition and Energy Market Reform

During the past 25 years, communities, small businesses and particularly consumers as individuals and households have invested heavily in energy from wind, solar and biomass. As of 2018, RES provide already well more than a quarter of Germany's total electricity production, while private citizens own roughly a third of installed RE (see country Chap. 13). Decentralised energy production has proved to be an efficient means for fostering both the *energy transition* and a low-emission economy. Essential measures such as planning designation or grid extensions are more likely to gain acceptance when civil society is involved (Ethik-Kommission 2011; Schomerus et al. 2014). The local community can educate citizens in responsible energy use. In addition to economic impe-

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<sup>23</sup>In the UK, as part of DECC's Community Energy Strategy, published on 27 January 2014, the renewables industry and the community energy sector committed to work together to facilitate a substantial increase in the shared ownership of new, commercial onshore renewables developments; an example of large suppliers supporting citizen (co-)ownership is the "Citizen's RES Coop" initiated by RWE in Germany.

tus, community involvement offers other advantages. Local social capital<sup>24</sup> is not limited to projects of self-organisation but can be a resource for future endeavours. Moreover, by reducing its carbon footprint and improving its sustainability profile, communities make themselves more attractive.

The broadened RE ownership structure innovated in countries like Germany, the Netherlands, Denmark or Great Britain primarily depends upon the particular form of *energy transition* those countries have chosen and the type of FITs at the core of those reforms.<sup>25</sup> Guaranteed FITs have proved to be the most effective means of repaying RE installation loans, providing at the same time investment security and a more accurate assessment of project risk while widening the investor circle, particularly citizens as individuals. By stimulating innovation, this model has enabled renewables to achieve grid parity, that is, reducing production costs to a level competitive with fossil energy (McKenna 2015). The success of this concept in promoting RES is exemplified by Germany, where the share of RE rose to 25.8 per cent already in September 2014, edging out brown coal as the country's primary energy source (AGORA 2015).

The consumer ownership model although already a proven success is slowed in its adaptation by two factors:

- Firstly, potential is sacrificed by inadequate potential for the scaling of investments; fewer medium- and large-sized projects with citizen participation are being realised (Rommel et al. 2018).<sup>26</sup>
- Secondly, FITs are being replaced by auctions, resulting in worsening refinancing prospects for RE plants. This trend particularly disadvantages small producers who cannot compete with the large ones.

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<sup>24</sup> Social capital is a sociological term, which describes the rate of social cohesion (the “social climate” so to speak), willingness for cooperation and the potential for mobilisation.

<sup>25</sup> The 2000 model law EEG is one of the legal acts most often copied in other countries around the world; it has been adopted and transferred worldwide: 71 countries and 28 states/provinces enacted some form of feed-in policies as of early 2013, led by developing countries with regard to number of FITs in place (REN21 2013).

<sup>26</sup> There are a few large- and medium-scale projects in Germany that are financed via closed-end funds, but other business models suffer from high intra-organisational costs and high transaction costs (Yildiz 2013).

This policy change will eventually impact the ownership structure. This already is the case in Germany where the ownership share of individual citizens and farmers decreased from about 50 to a little above 40 per cent between 2012 and 2016 (trend:research and Leuphana 2013; trend: research 2016). Large concerns are now investing in the RE business, for example, the German company RWE. The question is whether the resulting market consolidation and ownership concentration are compatible with the decentralised ownership structure essential to the energy transition as argued above (Rommel et al. 2018). If the energy transition is to continue to progress, and if the share of renewable energies is to reach 50 per cent of the total energy consumption, structural changes need to be made. Financing systems must be redesigned so as to include more and eventually all groups of society (Graichen 2015).

On a broader scale, transforming consumers into owners of RE installations strongly motivates them to more efficiently use energy. It also makes consumers more aware of energy use and triggers a learning process (Roth et al. 2018). This is a consumer educational process which in turn contributes to:

- Facilitating the use of ICT solutions, like smart metres and fostering closer alignment of consumption with volatile RE supply by increasing demand-side flexibility (economic)
- Encouraging the public to accept the energy transition, particularly grid extension and installation of new RE production facilities, for example, wind turbines, and also to provide practical information to civic and public agencies including public procurers in this field (social)
- Accelerating the energy transition by reducing emissions and the impact of energy production on climate and current externalities as well as contributing to sustainability goals (ecologic)

Expanding RE production installations and facilities would benefit not only individual consumers but also the small communities and entire economy of the European Union. While most households' energy needs would be provided by the jointly owned local facility, with excess energy sold to the grid, cheaper energy and an additional source of household

income would motivate people to become more knowledgeable consumers. As owners of the RE production facility, consumers now have an incentive to sell as much of the energy produced as possible in order to quickly amortise their investment. This provides an incentive to increase energy efficiency by conserving it, since every non-consumed kilowatt-hour increases profits of the consumer-owners.

Transition countries, in which rural areas often have limited access to energy, for example, Asia and Africa, may also be interested in the benefits of consumer ownership in RES. Access to energy is crucial to economic growth and for improving the quality of life. Demand for energy in developing countries is growing. Africa, for example, has 15 per cent of world population but only 5 per cent of global energy production; per capita energy consumption there represents only one-third of the world average—one-sixth if traditional biomass is excluded. The same situation obtains in Asia. Furthermore, many households in developing countries are not only poor but located in remote areas with no access to electricity at all.

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