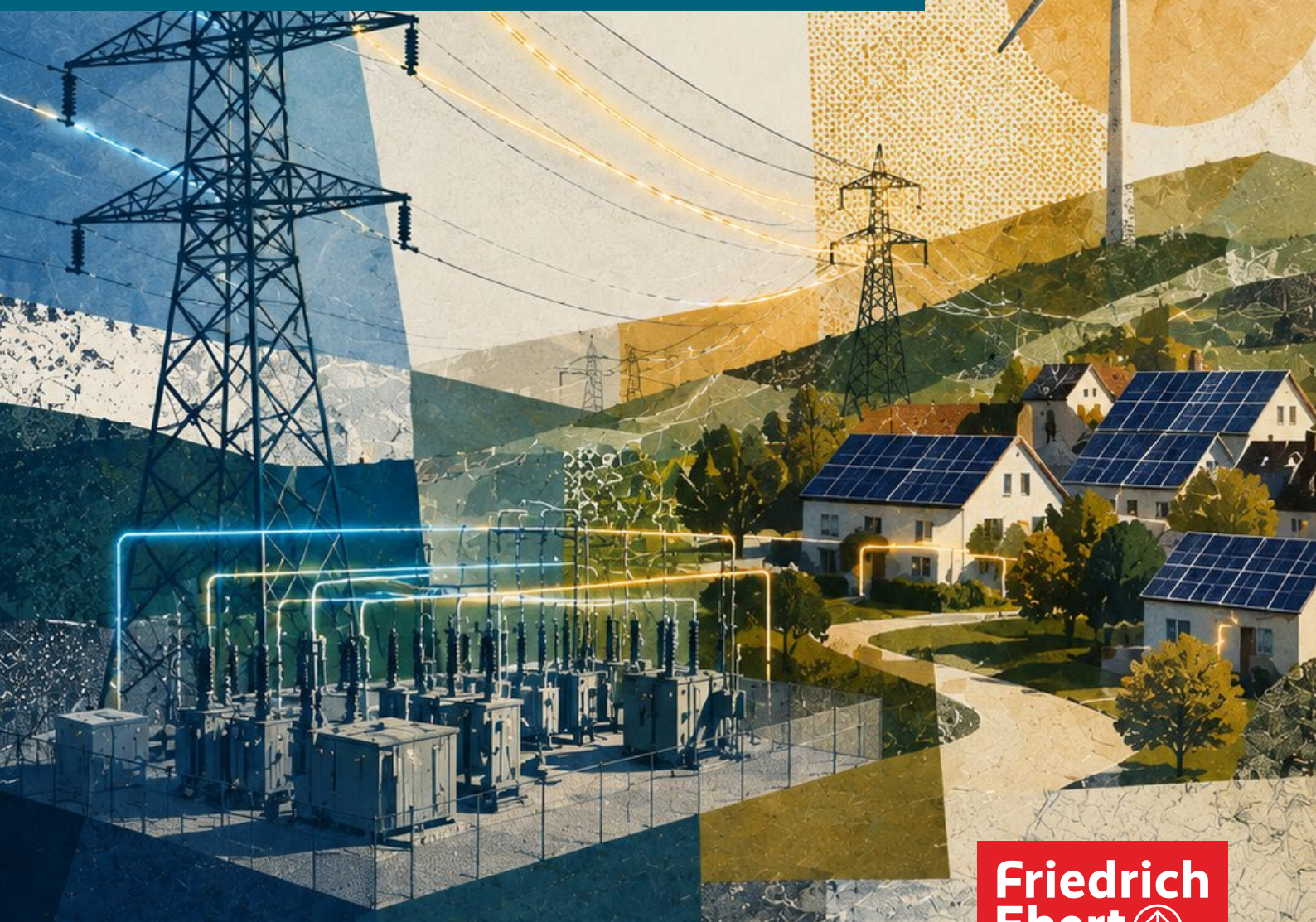


Chiara Antonelli, Irene Chiochetti, Greta Nadeschda Holle
and Ange Manon Tang
September 2026

Upgrading the grid, dividing the cost

*Addressing social justice in the
EU energy infrastructure upgrade debate*



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Abstract

This policy paper examines the electricity grid modernisation debate in the European Union (EU) through a social justice lens, consisting of two main aspects: the distributional impacts on households and the role of energy communities.

The analysis finds that tariff-based cost recovery models for grid modernisation do not generally account for household income, while network charges are largely unavoidable. Increases in these charges can therefore have regressive distributional effects, particularly for vulnerable households with less capacity to adapt their consumption or invest in flexibility technologies. The forthcoming investments in infrastructure foreseen in the European Grids Package will bring long-term benefits, but also a disproportionate burden on the most exposed, vulnerable households, who have less capacity to adapt and quickly shift consumption behaviour. The timing asymmetry of front-loaded costs against delayed benefits brings an increasingly evident social pressure. While several EU instruments (such as the Social Climate Fund and the Recovery and Resilience Facility) can be put in place to buffer the social impacts of grid modernisation, they do not explicitly address grid financing and rising network tariffs, which can potentially result in an electrification without adequate social safeguards.

The paper also sheds light on the important role energy communities can play in a socially fair energy transition. Beyond lowering energy costs for participants, energy communities can foster local resilience, acceptance of policy measures and a more efficient use of network infrastructure. Nevertheless, the deployment of energy communities remains slow, while their potential for energy self-consumption is particularly significant in rural areas. Yet, there is a recognised growth potential which is still untapped. Energy communities bring benefits for the grids too: they contribute to fewer transmission and distribution losses and, if well managed, they have been shown to improve network stability. More broadly, the bottom-up approach to energy production is a source of innovation that can ultimately help increase communities' resilience. However, there are specific barriers to a smooth integration in a modernised grid. Connection delays still exist due to several reasons, for instance, inadequate infrastructure, grid congestion, increasing legal requirements, tightening financial constraints and technical feasibility, which can vary quite significantly across Member States. While the European Grids Package, in its current form, does not present specific provisions on energy communities, it can still support their uptake indirectly, for instance by facili-

tating permit processing. This needs, however, targeted support following existing recommendations by the European Commission, as otherwise they will not manage to scale up equitably.

Overall, the study recommends greater attention to the social dimension of grid modernisation at the EU and national level. If no safeguards are put in place, uneven distribution of costs and benefits may arise, with consequential risks for public acceptance and ultimately a successful clean transition.

Introduction

Within the European Green Deal, the EU committed to achieving climate neutrality by 2050, with sustainable energy as a key pillar. The Clean Industrial Deal, launched in early 2025, has strengthened this agenda by prioritising affordable energy and a resilient clean energy system (European Commission, 2024). To achieve this, the climate transition goes beyond simply replacing fossil fuels with renewable and low-carbon energy sources. Instead, delivering this objective requires a system-wide transformation of the energy sector. The scale of this transformation is substantial, with an estimated €730 billion for distribution and €477 billion for transmission grid developments needed by 2040 (European Commission, 2025). Electricity grids in the EU are central to strengthening the EU's energy infrastructure as they connect countries through the transportation of energy every day, spanning over 11 million kilometres across the internal market (European Commission, 2023). However, the **financing and governance of this transformation are increasingly becoming a distributional and political issue**, without an explicit **focus on equity**, and it risks disproportionately burdening vulnerable communities. Investments in expanding and modernising the electricity grid are primarily recovered through regulated network tariffs and are passed on to consumers through grid fees on electricity bills, accounting for 27 percent of household electricity bills (Tennet, 2025; Arlia & Hutchinson, 2026). In practice, this means that the costs of infrastructure expansion are not directly absorbed by public budgets but are gradually socialised across end-users. This places additional stress on low- and middle-income households, who already spend a large share of their income on energy and have fewer resources to adapt. At the same time, electricity prices remain volatile across Member States, raising growing concerns over affordability and the distributional impacts of the energy transition (IEA, 2026). Electricity grids are then no longer viewed solely as technical infrastructure but increasingly as a central distributional and political fault line in the EU energy transition.

Therefore, **the modernisation of grids raises core questions of energy justice**, which can be understood along three dimensions: distributional, procedural and recognitional justice. Distributive justice concerns the equitable allocation of benefits and burdens among individuals in a society (Shejale et al., 2025). In this regard, distributional justice in energy grids relates to **how the costs and benefits of grid investments are allocated across society**, including how infrastructure costs are reflected in tariffs and grid fees. Procedural justice concerns the fairness,

transparency, and inclusiveness of decision-making processes, particularly regarding who can participate in and influence decisions about energy infrastructure planning and governance (Shejale et al., 2025). Thus, procedural justice in EU energy infrastructure refers to **how decisions on grid planning and investment priorities are made**. Inclusive participation is central to procedural justice, particularly in decisions about infrastructure affecting local or vulnerable populations, such as transmission lines, substations, or renewable installations (Shejale et al., 2025). Recognitional justice focuses on **whether the needs, perspectives, and experiences of different communities**, particularly marginalised and underrepresented groups, **are adequately acknowledged and respected** (Suboticki et al., 2023). Thus, recognitional justice is particularly relevant when grid expansion intersects with indigenous lands, rural communities, or historically marginalised populations (Sharma & Loginova, 2026). Recognitional Justice requires recognising existing governance systems, cultural values, and local expertise rather than imposing top-down solutions. There are two justice questions at the core of grid modernisation: **Who pays for grid investments and when? And who can access and benefit from modernised grids?**

The policy paper is structured as follows. Chapter 1 discusses how to mitigate the impacts of grid modernisation on households, addressing the central question: **to what extent does the way grid modernisation is financed risk having regressive effects on households, and what can realistically be done about it?** The chapter delves into the financing mechanisms of grid investments, how this might exacerbate households' vulnerability, and maps existing tools and potential shortfalls, leading to a set of policy recommendations. Chapter 2 focuses on the protection of energy communities, and it seeks to answer the question: **Are energy communities structurally disadvantaged in access to modern grids, and if so, what forms does the bias take?** Chapter 2 highlights the growth potential of energy communities and local benefits, while also discussing the readiness and potential scale bias, why the grid matters for energy communities and assessing opportunities by the Trans-European Networks for Energy Regulation (TEN-E) and the European Grids Package. A final section provides final reflections on the paper.

1.

Mitigating household impacts

1.1 How Grid Modernisation Costs are Recovered through Network Tariffs

1.1.1 The Regulatory Framework for Grid Investment Recovery

To accommodate the energy transition and maintain system reliability, electricity grids across Europe are undergoing modernisation and expansion. Thus, Distribution System Operators (DSOs) and Transmission System Operators (TSOs) are investing heavily. Across the European Union, one TSO per country is typically responsible for managing the high-voltage transmission network and ensuring system stability (ENTSO-E, n.d.). A notable exception is Germany, where four TSOs operate within the same national electricity market (Bundesnetzagentur, n.d.). DSO structures typically operate as regulated monopolies within defined service territories. While many countries have multiple regional DSOs, countries such as Cyprus, Ireland, Malta, Greece, Croatia, and Slovenia operate under a single national DSO (ACER, 2026). This raises an important issue: from a procedural justice perspective, **consumers have little to no market-based influence over network operators despite being significantly affected by their investment decisions**. Decisions regarding grid expansion and development are largely made by operators and regulatory authorities, raising questions about the inclusiveness and fairness of decision-making in grid development projects.

Although TSOs and DSOs are formally responsible for financing and implementing grid investments, **they ultimately do**

not bear the economic cost of grid investments themselves.

In most EU countries, TSOs and DSOs operate under a regulatory cost-recovery framework based on ex-ante revenue setting, meaning that regulators determine in advance the revenues that TSOs and DSOs are allowed to recover (ACER, 2026a). As a result, operators can recover approved investment costs through network tariffs, with the costs of grid modernisation ultimately borne by consumers through electricity bills. The tariffs are set and approved by national regulatory authorities and include the recovery of operational expenditures (OPEX), capital expenditures (CAPEX),¹ maintenance and personnel costs, technical losses, depreciation of grid infrastructure, investment financing costs, and an allowed return on capital (CEER, 2025). Capital is typically recovered through volumetric charges (€/MWh consumed), capacity charges (€/MW), and/or lump-sum annual fees (€/year) (ACER, 2026a). However, the European Union Agency for the Cooperation of Energy Regulators (ACER) highlights the limited comparability of network tariff structures across countries and calls for harmonised terminology for tariff elements (ACER, 2026a). This means that consumers contribute to paying for the investment through their electricity bills, bringing important distributive justice implications. Recovering grid investment costs through network tariffs means that the financial burden of grid modernisation is shared across all consumers via electricity bills. This can have uneven impacts, particularly for those consumers who spend a larger share of their income on energy and are therefore more exposed to rising costs. This brings us to a critical point: network tariffs do not generally account for household income. Because network charges are largely unavoidable,



A Belgian example

Box 1

*In Belgium, the TSO 'Elia' was authorised by the federal energy regulator 'CREG' to increase transmission tariffs by 77 percent for 2024–2027 to finance large-scale grid investment programmes linked to the energy transition (Elia Group, 2023). The increase in tariffs will lead to an additional cost of 2–3€ per household a month. From a **recognitional justice** perspective, these impacts are not experienced equally across Belgian society. Many households may not immediately benefit from these investments with the revenue generated from the tariffs if they do not own electric vehicles, heat pumps, or rooftop solar, despite already having higher electricity bills. This can reinforce inequalities, particularly for vulnerable households with limited capacity to adapt to rising energy costs.*

¹ OPEX refers to the ongoing costs of operating and maintaining the electricity network, while CAPEX refers to long-term investments in building, upgrading and expanding grid infrastructure (ACER, 2026).

increases can represent a greater burden relative to income for low-income households. The current cost-recovery model can therefore have regressive distributional effects unless accompanied by appropriate safeguards.

At the same time, while grid modernisation generates system-wide benefits such as improved reliability and renewable integration, these benefits and costs may not be distributed equally across households and regions. This is why several Member States apply special treatment for vulnerable households, recognising that different social groups have unequal capacities to deal with rising energy costs (ACER, 2026a). This is particularly relevant because tariff design and cost allocation determine how grid modernisation costs are passed on to consumers, shaping the distributional impacts of the energy transition.

1.1.2 The Front-Loading of Grid Investment Costs

The 2025 Council of European Energy Regulators' report highlights that the impact of electricity transmission grid development on consumer energy bills is not adequately taken into account during national network development plan monitoring (CEER, 2025a). This raises procedural justice concerns regarding insufficient integration of consumer impacts in the planning process. While grid modernisation delivers long-term benefits, they are not immediately reflected in household electricity bills. Also, the social implications of grid investment recovery are not distributed evenly across consumers, reinforcing distributive justice inequalities.

As investment requirements increase alongside electrification and decarbonisation objectives, economically vulnerable consumers may face growing affordability pressures, with annual network costs projected to rise by 50–100 percent, with grid investments reaching €100 billion annually by 2050 (ACER, 2026a). This creates a **timing asymmetry**, with clear distributive justice implications, whereby households face immediate cost increases while the benefits of grid expansion and modernisation materialise only gradually over time. Since network tariffs reflect not only existing grid capacity but also planned investments, consumers begin paying higher costs as soon as assets are approved and incorporated into regulated revenue calculations, long before utilisation rates increase or system efficiencies are fully realised. **In practical terms, households may face higher costs today and in the short term, while benefits like lower energy bills or better infrastructure will materialise years later.** Public acceptance of grid investment can be sensitive to how these cost increases are communicated, particularly when headlines are emphasising sharply rising network costs, which may affect perceived legitimacy even when long-term system benefits are acknowledged (interview with BEUC, June 2026). From a procedural justice perspective, this highlights the importance of how investment approval processes are designed and whose interests they prioritise. In other words, this appears as a front-loaded bill shock, where electricity bills rise as network tariffs begin recovering investment costs.

1.1.3 Distributive and Procedural Justice Implications

On average, network tariffs make up 25 percent of the total electricity bill of EU households, and energy regulators estimate that grid costs for consumers will nearly double by 2050 (Lewis & Jost, 2025). This is reflected in higher mandatory network charges without an immediate improvement in household energy services or costs. Since network tariffs finance collective infrastructure and apply to all grid users, households generally cannot avoid these costs. This can create distributional concerns where tariff increases place a greater burden on households with lower incomes, inflexible consumption needs or limited access to technologies that would allow them to reduce or shift electricity use. The monopolistic nature of transmission and distribution networks means consumers cannot switch providers, making network tariffs unavoidable for all users of the electricity system.

While the inability to opt out of network charges does not automatically make grid financing regressive, **distributional concerns arise when tariff increases disproportionately affect households relative to their electricity use and ability to benefit from flexibility measures** (interview with BEUC). The European Consumer Organisation (BEUC) has also previously called for consumers to retain the possibility to opt out of time-of-use network tariffs where participation may not be beneficial or feasible. In smaller single-DSO systems such as Cyprus, large TSO and DSO investment programmes can generate relatively high per-consumer tariff impacts because fixed network costs are distributed across a limited user base (ACER, 2025). As a result, consumers may experience higher network charges before the broader reliability or benefits of these investments fully materialise.

1.2 Vulnerability and the Unequal Distribution of Grid Costs

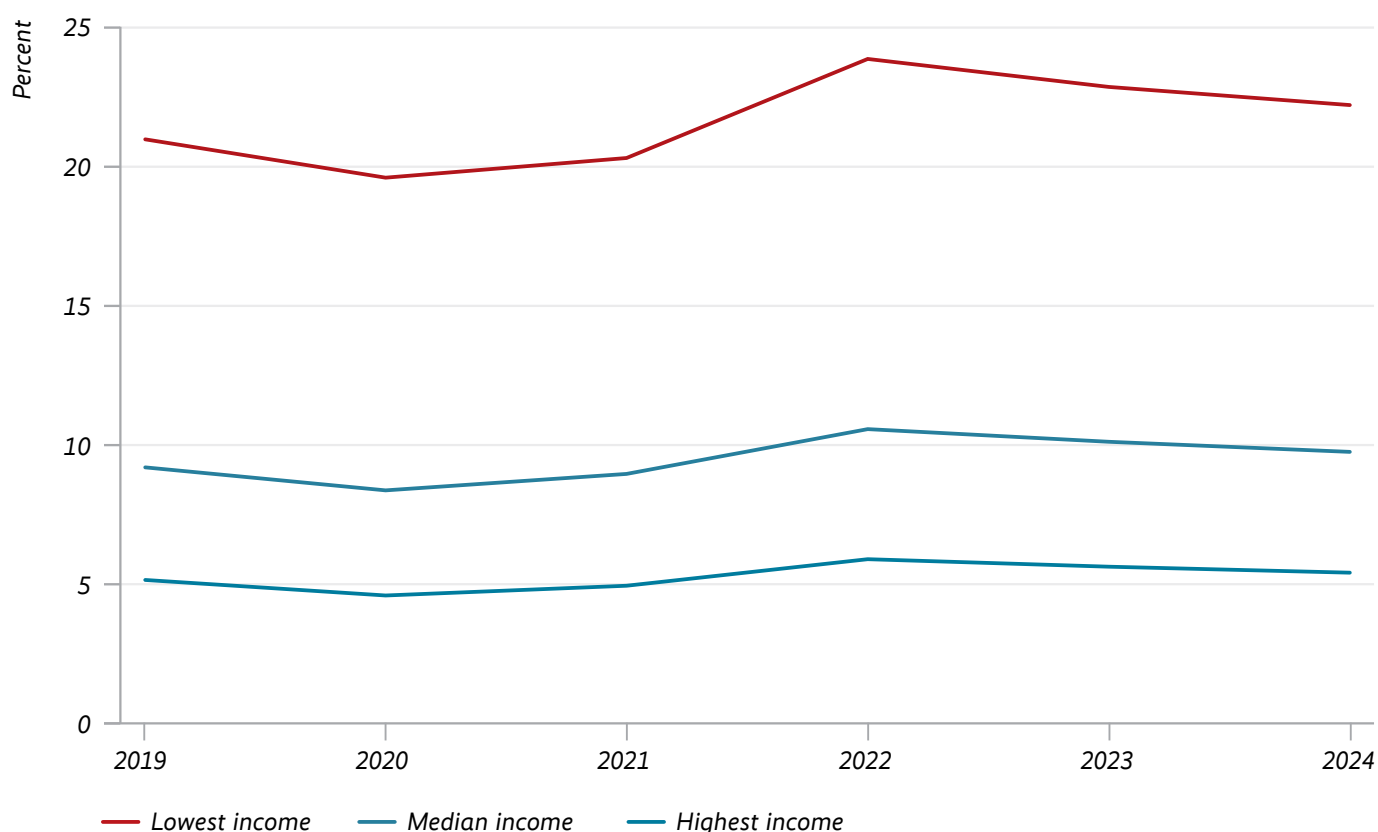
The distributional impacts of grid modernisation financing vary across households depending on three main dimensions: income, housing conditions and access to energy technologies.

1.2.1 Income Sensitivity and Energy Affordability

As electricity is an essential service, rising network charges can place a disproportionate burden on vulnerable households. This is especially relevant for households on fixed incomes, where even small increases in electricity bills can become a real financial burden, particularly in the context of energy poverty, where a significant share of disposable income is spent on basic energy needs (IEA, 2026a).

Figure 1 illustrates the percentage of income that is spent on energy for the lowest (1st decile), median (5th decile) and highest (9th decile) income in advanced economies. Here,

Share of income spent on energy by income group (2019–2024)



Source: IEA (2026a).

income refers to household disposable income. While the highest and median income groups on average spent less than 10 percent on energy, the lowest income group spent more than 20 percent on energy between 2019 and 2024.

1.2.2 Unequal Access to Benefits, Technologies and Flexibility Constraints

Flexibility constraints further shape how the costs of grid modernisation are distributed across households. Solar subsidies, feed-in tariffs, and tax incentives, all widely used to promote the adoption of solar photovoltaic (PV) technologies in recent decades, have disproportionately benefited wealthier households, as access to these mechanisms often still depends on substantial upfront capital investment (Kraaijvanger et al., 2023; Lage & Castro, 2022). An example of this is Germany, where the state supports PV systems and storage through tax exemptions, subsidised loans by the *Kreditanstalt für Wiederaufbau*,² (and the feed-in tariffs within the *Erneuerbare-Energien-Gesetz*³ (Gießle, 2026; Bundesnetzagentur, n.d.). Lower-income households often lack access to the upfront capital. Therefore, higher-income

households are generally better positioned to adapt to rising energy-related costs, as they are more able to invest in energy-efficiency measures that enable partial self-generation and reduce long-term dependence on grid electricity. Consequently, this creates a distributive asymmetry, where higher-income households can partially shield themselves from higher prices, and lower-income groups cannot. Similar patterns are observable in Portugal (See Annex 1).

Households that can install photovoltaic systems, heat pumps, electric vehicles and energy management systems are generally those with greater financial resources and access to suitable housing conditions (interview with ADENE, June 2026). As a result, wealthier households are better positioned to benefit from emerging flexibility opportunities and reduce their exposure to future electricity costs, while vulnerable consumers face greater barriers to participation. Beyond heat pumps and solar PV, unequal access to flexibility technologies extends to include enabling technologies such as smart meters. Households without access to these technologies have a limited ability to actively manage their electricity consumption and often can do little except to reduce overall consumption in

² German state-owned development bank that provides financing for infrastructure, housing, climate action, and energy transition projects.

³ German legislation supporting renewable energy deployment through financial incentives and priority grid access.

response to rising costs. By contrast, consumers equipped with smart meters, electric cars or other flexible technologies are better able to respond to time-of-use tariffs by shifting consumption patterns and optimising energy use.

Current discussions in Germany regarding time-of-use network tariffs for electric vehicle and heat pump owners illustrate how some consumers may be able to take advantage of tariff variations, whilst others cannot (Bundesnetzagentur, 2025). As a result, **tariff structures intended to promote flexibility may generate unequal outcomes depending on households' access to enabling technologies**. As network tariff structures increasingly incorporate flexibility incentives, unequal access to such technologies may therefore translate into unequal abilities to avoid or mitigate rising network-related costs. The ability to respond to time-varying network tariffs may also differ according to household circumstances and energy needs. Some consumers, such as households with specific health-related energy requirements, may have limited flexibility to shift electricity use away from peak periods (interview with BEUC). For these users, time-of-use network charges could create additional affordability pressures because essential energy consumption cannot easily be reduced. Similarly, evidence from Portugal suggests that these technological constraints are increased by low levels of consumer awareness. Furthermore, consumers who currently participate in dynamic tariffs tend to be those who are already familiar with energy markets and flexibility mechanisms, suggesting that the benefits of flexible tariff structures remain concentrated among a relatively small and informed group of consumers (interview with ADENE).

Recognition energy justice concerns are also evident for **renters and lower-income households**, whose ability to participate in the energy transition is structurally constrained. Renters typically have limited control over property-level investments, which are decided by landlords, creating well-documented split incentives (Shi et al., 2025). Tenants often face difficulties obtaining approval for technologies such as solar PV, heat pumps or smart energy systems, further limiting their ability to engage with flexibility schemes and benefit from tariff structures designed to reward active consumers (interview with BEUC). The European Commission identifies split incentives between tenants and property owners as a major barrier to energy-efficiency investments in multi-owner residential buildings, where collective ownership structures and technical constraints may discourage or delay renewable energy and efficiency upgrades (European Union, 2018). Similar constraints also affect **collective self-consumption schemes in multi-apartment buildings**, where technical metering requirements, coordination among occupants and grid connection limitations can restrict participation (interview with BEUC). As a result, renters and urban households often face limited capacity to reduce exposure to modernisation.

Housing conditions also influence access to flexibility and self-generation opportunities. Portugal has relatively few

citizen-led energy communities, while most projects are organised through private companies (interview with ADENE). Furthermore, Portuguese support schemes have traditionally been designed around individual apartments rather than entire residential buildings, creating additional barriers to collective investments in renewable energy and flexibility measures. These institutional and organisational constraints may limit the participation of apartment dwellers and renters in flexibility schemes and collective self-consumption arrangements. ADENE expects that wider participation in flexibility markets and energy management systems may take another five to ten years before becoming accessible to most Portuguese households. This suggests that the benefits associated with smart grids, flexibility services and dynamic tariff structures are likely to remain unevenly distributed during the early phases of grid modernisation, raising important distributive justice concerns.

1.3 Existing EU and National Measures to Protect Consumers

1.3.1 Social Protection Mechanisms and EU Support Instruments

Several EU and national-level mechanisms already aim to address the affordability and distributional impacts of the energy transition (see, for instance, the Portugal Case study in Appendix 1). The Social Climate Fund (SCF) was designed to contribute to a socially fair transition, which also means mitigating the adverse impacts on vulnerable households (European Commission, 2024a). Financed partly through revenues from the current EU Emission Trading System (ETS) and the upcoming ETS on buildings, road transport and additional sectors (ETS2), the Fund may indirectly help households adapt to rising electricity costs linked to electrification and grid modernisation, for example, through support for energy efficiency (European Commission 2023; 2025a). In addition, further EU initiatives, such as the Citizens Energy Package, outline the need for additional support for households experiencing an increase in bills, as well as concrete actions by the Commission and recommendations for Member States.

1.3.2 Remaining Policy and Governance Gaps

Despite the existence of EU mechanisms, significant limitations exist. Most current mechanisms, such as the SCF and ETS2, primarily focus on transport and heating fuels, energy efficiency and energy prices more broadly rather than the distributional impacts of electricity network charges linked to grid modernisation. Crucially, **most existing instruments in place in the EU do not directly address the (structural) distributional impacts of grid network tariff cost recovery models but instead focus broadly on energy prices and support to investments**. There is a lack of clear evidence that Member States are using existing tools to specifically offset rising grid costs, pointing to



Italy: Social Tariffs as a Mechanism to Mitigate Distributional Impacts of Grid Financing

Italy recovers electricity transmission and distribution costs through regulated network tariffs approved by the national regulator ARERA (ARERA, n.d.). As in most EU Member States, approved grid investment costs are recovered through network tariffs, placing the financial burden of grid modernisation on electricity consumers. According to ARERA, a typical domestic electricity bill consists of energy supply and retail costs (59.7 percent), taxes (9.9 percent), system charges (10 percent), and transmission, distribution, meter management and related network costs (20.4 percent) (ARERA, 2026). Network-related charges are recovered through a combination of fixed charges, capacity-based charges, and volumetric charges linked to electricity consumption. This mixed tariff structure ensures cost recovery while spreading grid costs across all users of the electricity system. To mitigate affordability concerns, Italy operates the Bonus Sociale Elettrico, which provides automatic bill reductions for vulnerable households (Servizio Elettrico Nazionale, 2026). Eligibility is primarily determined through income thresholds, and discounts are applied automatically to eligible households' electricity bills (Servizio Elettrico Nazionale, 2026). In 2025, approximately 2.7 million households benefitted from the bonus, and an additional 3.4 million households received 200 EUR electricity support through Decree-Law 19/2025 (ARERA, 2025). Since network charges are embedded within overall electricity bills, the scheme indirectly reduces the burden of rising network costs on vulnerable consumers.

The Italian approach offers several lessons for socially resilient grid financing. First, automatic enrolment significantly improves uptake compared to application-based support schemes. Second, it demonstrates that targeted affordability measures can be integrated into existing tariff structures without fundamentally altering the regulated cost-recovery model. However, important gaps remain. Despite its extensive coverage, the Bonus Sociale works as an ex-post compensatory measure. The scheme targets income vulnerability rather than a general exposure to rising network charges and therefore does not directly address the distributional impacts of grid modernisation. Furthermore, the scheme does not address the timing asymmetry between immediate tariff increases and the delayed benefits of grid investment. Finally, renters and households unable to invest in technologies remain disadvantaged, as the social tariff reduces costs but does not address structural barriers to participation in the energy transition.

uncertainty over how SCF allocations are being deployed beyond fixed percentage envelopes and raising concerns that, in a geopolitically constrained fiscal context, some funding may be absorbed into broader budgetary pressures rather than targeted network tariff relief (interview with BEUC). This creates a policy gap where **electrification increases bills without social cushioning**. Stronger guidance should be provided to national regulators on how to design network tariffs that encourage flexible electricity use, while protecting vulnerable consumers and reducing energy poverty (Lewis & Jost, 2025).

Other EU mechanisms, such as the European Grids Package, do not sufficiently address the scale and urgency of investment needs at the distribution level, where pressures are most acute (Digital Europe, 2026). Similarly, while the Citizens Energy Package represents an important step towards strengthening the consumer dimension of the energy transition, it does not yet provide a comprehensive framework for mitigating the social impacts of rising network charges (Rescoop, 2026). It therefore risks remaining an empty promise if not backed by strong enforcement mechanisms. In addition, given that tariffs linked to grid investment have already increased in several Member States, vulnerable households may already experience the front-loaded bill shock before the effects of EU instruments can be felt. Moreover, current policy discussions tend to

focus either on vulnerable households or wealthier consumers capable of investing in clean energy technologies, while paying **insufficient attention to lower-middle-income households** who often do not qualify for targeted support measures and also lack the capital required to invest in technologies such as electric vehicles, solar PV or heat pumps (interview with BEUC). As a result, they risk becoming a “missing middle” in the energy transition.

Energy taxation and levy structures vary significantly across Member States, increasing the risk that households become residual payers of the energy transition through electricity bills and network charges (European Commission, 2019). In addition, social tariffs and reduced network charges are implemented differently across Member States. For instance, special treatment for vulnerable households, including reduced use-of-network charges in Austria, Belgium, Croatia, Italy and Portugal, and reduced connection charges in Austria, Cyprus, Hungary, Latvia, Lithuania, Malta, Poland and Slovenia, applies (ACER, 2026a). This creates unequal levels of consumer protection and increases the risk of geographic inequalities. As a result, there is no consistent approach at the national level, nor a coordinated EU framework to address the social impacts of grid investment recovery through network tariffs. Given the scale of projected grid investments, these distributional effects are likely to become more pronounced. The case of Italy (Box 2) shows that social tariffs

are important to cushion the impacts of rising electricity costs. However, they are better understood as compensatory measures than as a comprehensive solution to the distributive justice challenges associated with financing large-scale grid modernisation through network tariffs.

1.4 Recommendations: Making grid financing socially resilient

While network tariffs are not social policy tools (a role that can be taken by other market and non-market-based instruments, such as taxation, regulation or transfers), they do hold potential, through careful design, to alleviate the social impacts on consumers, especially those who are less able to swiftly adapt, thereby being more exposed to rising energy prices. To ensure that grid modernisation remains socially just, stronger affordability and distributional justice safeguards should be integrated into electricity network financing.

A. Embedding distributional impact assessments in tariff setting

As it stands today, tariffs' design normally reflects costs only, which leaves their distributional impacts largely ignored. Tariff-setting procedures could incorporate mandatory affordability and distributional impact assessments. National Regulatory Authorities (NRAs) should be required to conduct affordability and distributional impact assessments for setting up tariffs, updating them as part of the approval of major TSO and DSO investment plans processes. As it stands now, according to the current guidelines, NRAs already must ensure transparency in network charges for the public interest. The same 2026 guidelines encourage further consideration of system-wide impacts and the effects on consumers. By adopting distributional impact assessments, the effects of grid investment recovery are explicitly considered in planning decisions, addressing existing procedural gaps identified by European regulators. The assessment could be integrated into current regulatory processes, supported by the Agency for the Cooperation of Energy Regulators (ACER), in coordination with the European Semester.

B. Integrate mechanisms to smooth tariff impacts over time

To respond to the timing asymmetry between front-loaded costs and long-term benefits, time-smoothing mechanisms can be applied. Guidelines already encourage gradual tariff adjustments, complemented by temporary support for vulnerable and less flexible households. This can be accompanied by temporary solutions for more vulnerable and less flexible households to adjust and gradually opt in to increased tariffs. Another opportunity is the adoption of dynamic tariffs. Dynamic tariffs can be more adaptive to flexibility needs, partially lowering network expansion needs in the short term and reducing bills for households who can

modify their electricity usage during the day. With strong awareness and communication, this can enhance affordability and access to renewable energy. Although charges may eventually rise, phased adjustments can create the right buffer for many households to adjust and shift their consumption, in line with the energy sufficiency principle.

C. Strengthen social tariffs to clearly address network costs in the short term

Cost reflectivity is the basic principle in building network tariffs, which means that the charges should reflect the underlying costs of grid maintenance, investments, and so on. While cost-reflective charges are needed for efficiency and to support capacity and infrastructure costs, there is also a need to balance out distributional outcomes. At the national level, it is possible to establish tariff systems that take costs into account whilst also being socially responsible, by combining capacity-based charges with compensatory measures. This is the case, for example, in Portugal, where such regulations are currently under review. While these measures are only a partial response to increasing costs, they can serve as a relevant buffer for households more vulnerable to changes in their electricity bills, especially if less able to swiftly change their consumption behaviour. As the Commission guidelines highlight, there is a need for tariffs to be cost-reflective, incentivising efficient usage and providing a price signal for behavioural change.

D. Stronger use of public funding to reduce impacts on tariffs.

The use of public funding is already foreseen by the guidelines, but it is necessary to scale up the effort of national public budgets and the use of EU funding instruments like the upcoming SCF, ETS2 revenues and Cohesion funds, for instance. Public funding would have an important role in partially supporting grid financing, thus alleviating the pressure on consumers' bills. The Commission guidelines on future-proof network charges recognise the use of public finance as a legitimate complement to cost recovery through tariffs, thereby avoiding price spikes and improving grid modernisation affordability (European Union, 2026). This must be done in accordance with the non-discriminatory principle and provided that the use of public resources does not undermine the incentive effect. Bearing this in mind, support with public funding can also be a helpful resource for the implementation of social bonuses and tariffs in the sector.

E. Minimum EU-level coordination for social tariffs design.

Network tariffs are a national competence, and NRAs are independent authorities. In this context, to facilitate the mainstreaming of best practices, strengthening coordination

between national designs and EU and national policy instruments is crucial for addressing social concerns. A stronger link should be established between EU-level instruments that could support financing or provide EU-level guidelines on social inclusivity, along with the already published guidelines for efficiency. This could be done with ACER, which already plays an important role in sharing best practices across the EU. This coordination would greatly support reducing fragmentation in the approach to social tariffs for energy consumption, for instance, and to overall optimise the system's costs.

F. Improve inclusivity, transparency and graduality in the processes for tariff cost recovery.

The Commission already foresees the necessity of transparent, timely and adequate communication in such changes, which should be part of a concerted effort at the national level to make them accessible and understandable to consumers. However, the lack of adequate communication, knowledge sharing and engagement in the process can negatively affect consumers' awareness and, ultimately, their consumption decisions. Local participation in electrification through municipalities, knowledge networks, national public consultations, information channels and continuous engagement in a simple and approachable way is thus crucial to ensure that citizens can take part in the process, better understand their consumption behaviour and foster a shift towards cheaper, environmentally friendly alternatives.

2.

Protecting Energy Communities

As Chapter 1 highlighted, grid modernisation entails large investments and can disproportionately affect vulnerable and low- and middle-income households. These groups are usually not engaged in discussions, with decisions being made by TSOs and DSOs. In this context, the rise of energy communities offers a meaningful shift: transforming citizens into active participants and decision-makers in the energy transition, while helping to lower their energy bills.

Energy communities are **local communities** composed of diverse actors, including natural persons, Small and Medium Enterprises (SMEs) and local authorities, gathered under any legal entity. Members of energy communities differ among EU countries, but local authorities and citizens tend to be the most predominant groups. Cooperatives are also common members, while SMEs are involved to a lesser extent. Among citizens, the middle class is overrepresented, but there are increasing efforts to ensure that low-income and vulnerable citizens are aware and involved in such projects, in particular through European projects (Interviews with Energy Cities and REScoop, June 2026).⁴ Members participate in the **energy transition and energy efficiency** by undertaking a range of activities, from **local energy production to consumption** through supply, distribution, storage, heating and mobility services. Overall, these energy communities provide local benefits, especially by offering lower electricity bills to members, empowering citizens, and potentially relieving pressure on the public grid. However, energy communities' deployment is slow – in January 2025, only 27 percent of the objective of one energy community per municipality over 10,000 inhabitants set by the REPowerEU plan was achieved (European Court of Auditors, 2026). Different factors can explain this situation, including structural problems in easily connecting to the grid caused by national and local regulations, as well as practical constraints.

Regarding the actual grid constraints and the grid modernisation planned by the EU, one of the main questions is: **is there a risk of “readiness” criteria in grid connections favouring large corporate entities over local cooperatives and energy communities’ projects?** Chapter 2 focuses on

protecting energy communities by questioning whether energy communities are structurally disadvantaged in access to modern grids and what the bias is (procedural justice). It will also highlight the importance of the grid and the potential of TEN-E and the European Grids Package for their development in a just way for members and compare them to large corporations.

2.1 Energy communities – are they ready to scale compared to corporate developers?

2.1.1 Growth potential of energy communities

As discussed in the previous Chapter, the European Commission has recently released the Citizens Energy Package, setting out concrete actions to provide affordable and clean energy to citizens by lowering bills for households, protecting and empowering consumers, tackling energy poverty and implementing the existing EU laws effectively (European Commission, 2026). Under Action 5 – boosting energy self-consumption and energy sharing among citizens – the Commission commits to guiding Member States on how to **unleash the potential of energy communities and energy self-consumption**. This potential growth has been estimated to increase the installed renewable energy capacity of community households up to tenfold.⁵ Namely, by 2030, energy communities could contribute up to 90 GW, accounting for **8 percent of total renewable electricity generation produced by over 16 million households and 630,000 SMEs**⁶ (European Commission, 2026). The Commission also estimates that while more than 8,000 energy communities are currently active, **their potential is particularly significant in rural areas**. The potential of energy communities in urban areas is also recognised for their strong social, environmental and economic component as they can ensure easier access to renewable energy and bring economic advantages to all citizens (Di Battista et al., 2024). Often this occurs through people-centred governance, such as cooperatives, which prioritise community benefit over profit maximisation (Barrachina et al., 2025). However, this potential varies across EU countries and cities, as it depends on characteristics related to the population density, the building stock, energy resources available and grid requirements.

⁴ See also the [Inclusivity guide for energy communities](#) (2024).

⁵ Based on a forthcoming study by the European Commission's Energy Transition Expertise Centre (EnTEC) on the potential of citizen energy, cited in the Citizens Energy Package.

⁶ Idem.

2.1.2 Local benefits of energy communities

From a grid perspective, energy communities provide local and national benefits (Sepehrzad et al., 2026). While centralised conventional energy systems generate energy losses because of the long distances they must cover, which can result in more power being created than necessary and increasing bills, producing and consuming electricity **locally reduces transmission and distribution losses**, as fewer electrons are wasted on the way. More broadly, local energy production from renewable sources, if coupled with energy storage systems, including batteries, can **help improve network stability** by storing energy surplus during high production periods instead of sending it back to the grid, and releasing it when the generation is low, or when there is a peak in demand. This reduces the risk of electricity shortage, especially in remote areas. Moreover, energy communities can stimulate innovation, setting up experimental pilots for energy innovation, such as smart grids, distributed generation, sustainable heat, neighbourhood batteries and flexible transport tariffs (Neij et al., 2025). These innovations can increase the system resilience of configured microgrids with sufficient generation, storage, and islanding capability, which could apply to certain energy communities, including in the case of black-outs, by enabling local distribution systems to work without the public grid.

2.1.3. Readiness and scale bias favouring corporations rather than energy communities?

In March 2026, the European Court of Auditors (ECA) released a special report on energy communities, highlighting their unfulfilled potential (European Court of Auditors, 2026). Several barriers and challenges hinder the realisation of energy communities, including the legal framework, limited capacity, risk transfers, current market structure, and connection grid issues. Even though energy communities are defined in EU legislation, Member States are obliged to elaborate more detailed conditions to enable their full deployment (European Commission, 2024b). However, the ECA estimates that **the current definitions of 'energy communities' lead to confusion and are used inconsistently** in two out of four of the audited Member States.⁷ This lack of clarity is especially relevant for apartment buildings, accounting for 48 percent of the EU population in 2023. Owners' associations, which are created for managing buildings, cannot use their legal structure to register as an energy community but need to create an entirely new, separate legal entity. In this regard, the Polish Ministry of Climate and Environment considers the legal framework of energy communities to be fragmented, as it lacks clear interpretations, changes frequently and is marked by excessive formalism, as one of the main barriers (ECA, 2026).

According to a study prepared for the Commission in 2024, the market structure does not foster the establishment of an energy community because it holds back direct participation in the market and does not plan or foresee any regional and local markets within it (European Commission, 2024b). Therefore, estimating the total costs of an energy community, including contracting and deploying infrastructure, billing services, and the non-monetary costs, is nearly impossible. Other remaining barriers are technical systems obstacles and regulatory requirements related to the grid, such as delays in connection, and will be further explained in 2.2.

2.2 Energy communities and the grids

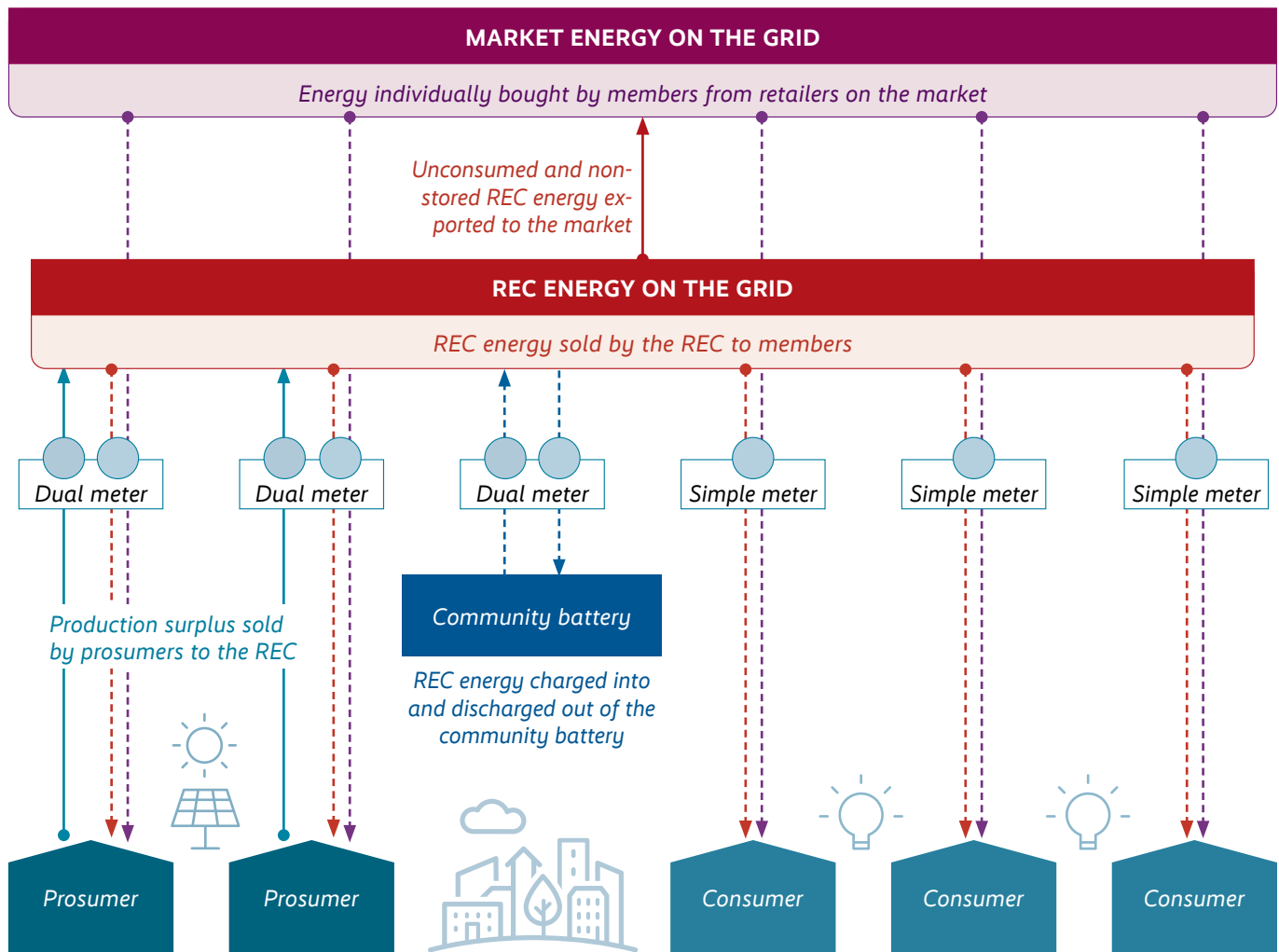
To understand the scalability of energy communities, it is also necessary to consider their potential effects on grid planning and operation and how grid pricing and regulatory conditions influence their structure and operation (Kerschler et al., 2023, cited in Taxt et al., 2025). To do so, knowing the relations between the grid and energy communities is needed before getting into the grid barriers.

2.2.1. Understanding the role of the grid within energy communities

While requirements differ depending on national contexts, local energy production shared among energy community members typically occurs through the connection to the public grid. As presented in Figure 2, the energy is first produced and consumed by prosumers (Balegamire & Gautier, 2025). As presented in Figure 2, the energy is first produced and consumed by 'prosumers' (Balegamire & Gautier, 2025), a term that refers to individuals or groups who produce renewable energy for their own consumption. The energy surplus is then sold to the other members of the energy community and **flows through the public grid**. On the one hand, if the energy generated does not meet the energy community's demand, consumers will buy energy individually from the market. On the other hand, when the energy produced exceeds the demand and is unconsumed and not stored, the energy is exported to the market. In the case of efficient energy storage, the energy community's independence is improved because energy can be used or stored whether the demand is met or not.

Although energy production has become increasingly decentralised, partly due to the development and democratisation of solar PV and heat pumps enabling pro-active citizens in the energy systems, energy distribution remains heavily dependent on DSOs, which often have a monopoly status (Bonfert, 2024). While energy communities can sell electricity surplus to the usual energy supplier, they are not

⁷ See Appendix 2 for definitions and characteristics of "Energy Communities" in EU law



Source: Balegamire, & Gautier, 2025.

yet legally allowed to manage distribution grids, execute community-to-community trading, trade in electricity markets or with third parties outside the energy community (Schuh et al., 2025). Therefore, **significant cooperation between energy communities and DSOs is needed to ensure their proper integration into distribution grids**. However, grid-connection processes and the constraints under which DSOs operate can create significant barriers, outlined in the next sections.

2.2.2. Grid-related barriers hindering energy communities' development

DSOs are responsible for connecting energy communities to the distribution grid. However, energy communities can face significant delays or refusals from DSOs in being connected due to several reasons, including non-adapted infrastructure,

grid congestion, legal requirements, financial constraints, and technical feasibility, which vary across EU countries, highlighting the lack of distributional justice in the distribution grid system.

The Polish Ministry of Climate and Environment notably mentioned to the ECA that energy cooperatives usually experience **delays or refusals from grid operators when they want to connect their new renewable energy installations**, due to **the poor conditions of local grids** (ECA, 2026). In the Netherlands, in 2024, more than 4 GW of renewable capacity was waiting to be connected, with the potential to supply energy to around 3 million people, while the average connection time was reported to be 280 days that year (Altaghlibi, 2024). In general, the maximum connection delay in the Netherlands is 132 months, compared to Italy and Poland, which are 15 and 16 months, respectively (European Court of Auditors, 2026). This

delay can be explained by the grid congestion,⁸ which prevents the timely connection of renewable energy projects. The electricity grid poses a challenge when grids are shut down, or their output is curtailed due to grid congestion, which, however, depending on the context, happens mainly in rural areas, whereas in cities this sort of problem is less common (Interview with Energy Cities).

Under EU law, while **no deadlines for connecting energy communities to the grid exist**, some provisions for speeding up grid connection in different contexts have been established by the Renewable Energy Directives (RED II and RED III), but transpositions differ across EU countries. In the Netherlands, the law prohibits discrimination between user categories when processing grid connection requests, and if no excavation is required for installation producing less than 50 kW, the deadline to connect is 84 days. On the contrary, in Italy, national requirements do not give priority to energy communities specifically, but grid operators **must give priority to connection requests coming from renewable energy projects with a specific deadline**. On the other hand, for solar installations up to 200 kW, the deadline is 10 days. Additionally, energy communities can face high or unclear connection costs, which may hinder their development (European Commission, 2024b). In France, for instance, the costs of connection are mentioned as an

important challenge, especially in more rural areas due to lower grid capacity, which can compromise the economic feasibility of many projects (Sebi & Vernay, 2020). Historically, the grid was designed with large, centralised power plants with energy transported to remote rural areas; connecting new renewable energy production plants implies grid reinforcement costs. However, in some cases, these small-scale investments could participate in limiting costs, compared to centralised grid extensions (Sepehrzad et al., 2026). Technical feasibility of the connection between energy communities and the grid needs to be considered because their integration implies many technical impacts, including bi-directional power flow – prosumers can consume electricity from the public grid and sell the extra energy produced; voltage limits; and thermal congestion (European Commission, 2024b).

Being connected to the grid does not necessarily enable energy communities to function effectively. Sometimes, when electricity generation exceeds the grid capacity, i.e. causing grid congestion, DSOs can curtail electricity generation or temporarily disconnect installations from the grid. In Poland, in the first half of 2025, this action from the DSOs resulted in 600 GWh of renewable electricity curtailed (European Court of Auditors, 2026). This grid congestion imposes substantial costs across the EU and is unevenly distributed between Member States. In 2023, the

⁸ See here the Capacity Map in the Netherlands: <https://data.partnersinenergie.nl/capaciteitskaart/totaal/afname>.



Box 3

Energy communities ensuring procedural and distributional justice – case study on the Hyperion solar community (Hyperion, n.d.)

In Greece, energy poverty is a well-recognised problem. In 2023, it concerned 12.7 percent of the population. To tackle this situation while ensuring a fair transition and social inclusion, energy communities have emerged as a solution. In 2020, 113 inhabitants of Athens founded the Hyperion energy community to provide clean energy to the local community, promote energy democracy and the social and solidarity economy in the energy sector, while addressing energy poverty. The project is a collective self-consumption through a virtual energy netting type and consists of about 500 kW of photovoltaic panels installed on the ground and benefits 285 people, composed of 75 percent of households, 15 percent of local businesses and 10 percent of organisations. In 2024, after four years of planning and installation, the energy community was set up (ReScoop, 2024). They also decided to give 5 percent of the electricity produced to vulnerable households (European Commission, 2026a). In practice, the energy community uses a virtual energy netting model, which enables the members to build a collective photovoltaic station and to own a certain percentage, depending on the energy needs they want to meet in their home or business. Therefore, the energy generated is offset against the energy consumed, and participants only pay the difference if they consume more than the energy produced. However, members also pay charges related to network fees, as the Greek law foresees connection fees. As of 2026, 12 vulnerable households were reached, including 4 vulnerable women experiencing energy poverty. To do this, the energy community's managers partnered with municipalities, which have access to social registries and were able to identify eligible vulnerable households, considering other criteria defining vulnerability beyond the economic ones. The Hyperion energy community provides an insightful case study, notably for its efforts to protect vulnerable households. However, it also experienced delays following the project's approval and errors by the energy supplier, which resulted in higher bills for members, highlighting practical challenges associated with implementing such initiatives (interview with REScoop, June 2026).

Agency for the Cooperation of Energy Regulators estimated that managing congestion in the EU power grid was costing more than €4 billion, with 60 percent of those costs absorbed by the German system (ACER, 2024). In addition, grid connection fees vary among EU countries: in Spain and Austria, exemptions are foreseen, depending on the proximity to the grid, while in Greece, distribution fees are imposed regardless of where the energy community is located (interview with REScoop). Discussions about discounts on the grid tariffs are ongoing in some countries, such as Spain; however, from a financial perspective, this puts system operators under a lot of pressure, as it requires major investments, and there is the risk of disconnection for energy communities (interview with Energy Cities).

2.3 TEN-E and Grid modernisation impacts on energy communities

The European Grids Package, including the revision to the TEN-E Regulation, a proposal to accelerate permit-granting procedures and two guidance documents, does not contain specific provisions for energy communities. While energy communities are recognised to accelerate the phase-out of fossil fuels and are **mentioned as actors requiring grid**

modernisation in a more decentralised and flexible electricity system, they are not explicitly supported through targeted measures. The European Grids Package may nonetheless bring some advantages as it **aims to ensure faster and simpler grid connections**, including for small installations, and to increase grid capacity and flexibility, which could directly benefit community projects, given that grid connection is widely recognised as a major barrier. However, some DSO organisations (DSO Entity; E.DSO, 2026), point out that the new TEN-E framework remains predominantly focused on cross-border TSO projects, rather than establishing a dedicated framework or funding for distribution actors. For energy communities, this is particularly important as DSOs enable about 1.5 million EU citizens to be part of energy communities (CEDEC, n.d.). Moreover, even for cross-border projects, the Commission prioritises large-scale initiatives such as Projects of Common Interest and Projects of Mutual Interest, and Energy Highways, which tend to sideline the specific challenges faced by smaller-scale cross-border initiatives, such as cross-border energy communities (see box 2 for more details) (European Commission, n.d.; European Commission, 2023a).

At the same time, the approach to system planning remains largely centralised and top-down, with limited emphasis on bottom-up processes, which undermine procedural justice in



Box 4

Cross-border energy communities

30 percent of the EU population lives in internal border regions, which account for 40 percent of the EU territory (Schuh, 2025). Developing cross-border energy communities (CBECs) has increasingly gained attention over the past few years. EU laws explicitly mention **the importance of cross-border cooperation and the possibility of creating cross-border renewable energy communities (CBRECs) and cross-border citizen energy communities (CBCECs)**. More recently, the Energy Community Action Plan promotes regional and cross-border cooperation, recommending that Member States explore opportunities for CBECs and remove legal or administrative barriers as well as consider integrating energy communities in existing macro-regional strategies and relevant action plans (European Commission, 2026b). However, no formal EU legislation defines what a CBEC is, and very limited information on that topic is available. In the Handbook on CBEC mandated by the European Commission, the authors offer two definitions: 1) a CBEC has all characteristics of an energy community with the particularity of being controlled by members and shareholders of the cross-border region, having energy activities operating in both parts, sharing benefits with all members; 2) a Quasi – CBEC is an energy community that develops or provides energy services **without distributing energy across the border**, but with at least a joint management, a joint funding or a joint resource. In practice, when undertaking energy activities such as production, distribution and consumption across borders, CBECs face several additional challenges beyond those already faced by classic cross-border cooperation – administrative and cultural obstacles. CBECs meet barriers shared by other energy communities, including legal and technical challenges rooted in unfavourable frameworks at national levels, and specific ones such as [the uneven preparedness for cooperation on energy between member States](#) (European Commission 2021). Looking at the grid system, several obstacles hinder the development of CBECs. For instance, [the Smart Energy Region Emmen/Haren project](#), which aims at sharing renewable electricity by connecting two wind parks at the border between a German and a Dutch municipality, is encountering a barrier due to the prohibition of the establishment of a direct line to connect electricity distribution grids. So far, the connection is only possible through an extra-high-voltage grid, which is blocking the implementation of the cross-border energy exchange. Additionally, CBECs need to deal with different market structures, gate closure times and trading intervals, grid access rules and transmission tariffs, the allocation of interconnection capacity, and how to manage grid congestion between cross-border regions.

the energy transition. This can create major risks that local capacity needs may be overlooked in network development plans (E.DSO, 2026), including those of energy communities. One of the Guidance documents on efficient and timely grid connections recognises the failure of the ‘first-come, first-served’ principle that has majorly disadvantaged energy communities because of a lack of capacity to promptly act compared to large and well-resourced actors and advises Member States to move towards a **first-ready, first-served system** to avoid discrimination (European Commission, 2025b). Large developers are often better placed to submit multiple or less mature applications, which can occupy scarce queue capacity and delay smaller projects. This can block grid connection requests from citizens’ initiatives seeking to develop small-scale self-consumer projects. This is the case, for example, for Western Macedonia in Greece, a former lignite-producing region, where the expansion of large-scale solar plants is increasingly taking place at the expense of small community-based projects (interview with REScoop, June 2026). Although it does not explicitly mention energy communities, such a new approach could potentially put energy communities in a more favourable position, increasing distributional justice among the population. While the European Grids Package aims to improve grid infrastructures, accelerate connections and permits, enhance public participation and better integrate renewables and prosumers, some aspects could be further improved during interinstitutional negotiations to address the challenges faced by community-led initiatives compared to large market actors. For example, the European Parliament is pushing for the threshold for the “benefit-sharing” provision to be lowered from 10MW to 3MW, thereby ensuring that more projects share their benefits with the affected local communities. In addition, what is missing is the full enabling of the implementation of energy communities and their participation in local flexibility markets, which could be addressed by incentivising DSOs to procure greater volumes of flexibility, like the way TSOs already do with large industries (interview with Energy Cities, June 2026).

On the other hand, the European Commission’s recommendations on supporting the development of energy communities and maximising the potential of self-consumption provide some guidance to national governments for their better integration into the grid (European Commission 2026b). This document includes permitting and system integration recommendations such as: simplify grid connection with a timely, transparent, proportionate and simple procedure; ensure that grid operators are prepared for the expected growth of energy communities in their grid development plan; when there is insufficient grid capacity and where it is technically possible, ensure that energy communities can enter a flexible grid connection agreement with the system operator; and allow Citizens Energy Communities to manage closed distribution grids. The Commission also recommends that Member States implement flexible licensing regimes, which enable energy communities, in cooperation with a balancing responsible party, to supply energy or provide flexibility services to final consumers. Additionally, under the digital innovation and system inte-

gration area of the Energy Community Action Plan, the Commission plans to explore better integrating the local energy market at the distribution grid scale into the wholesale market by providing common standards. This would help small, distributed energy systems to operate efficiently but with more flexibility.

2.4 Recommendations

A. Addressing ECA report’s findings: Clarification of the legal framework

As mentioned in the **ECA report**, and acknowledged in the Energy Communities Action Plan, there is a concrete need to develop effective enabling frameworks for energy communities. In particular, greater clarity is needed regarding definitions, which currently lead to confusion, as well as incomplete and delayed transposition at the national level. Addressing this issue requires **structured dialogue among relevant actors**, including current energy communities, national governments, DSOs, and EU institutions. Such discussions are necessary to identify practical ways to improve and harmonise these definitions and their related provisions, while considering national specificities and barriers. Additionally, as cross-border energy communities are gaining prominence, with multiple pilot projects across Europe, **establishing formal definitions in EU legislation** is the first essential step. This would support their effective development and integration into the public grid across Member States, while also fostering enhanced cross-border cooperation.

B. Implementing the Commission’s recommendations for a comprehensive and effective grid simplification

The simplification of grid connection procedures is already foreseen in the **Commission’s recommendations**, but it requires **full and consistent implementation**. In particular, the Commission notably advises national governments to remove permit-granting procedures for small-scale solar PV and storage installations and to ensure timely, transparent and simple grid connection procedures in line with RED II, RED III and other EU legislation, including showcasing several practical examples of supporting measures. One such measure is the establishment of clear timelines to inform energy communities about applicable procedures, costs and approval processes, which can improve visibility and predictability, while helping them to better assess the economic feasibility of their projects. Another measure involves providing dedicated assistance and guidance for the application processes, as well as the simplification of administrative and technical requirements where possible. At the same time, these actions can foster the **participation of vulnerable households**, which tend to be less informed and have fewer administrative and technical skills, compared to higher-income households, SMEs and more broadly, large corporations. As the Commission’s rec-

ommendations are not binding, to ensure full implementation and overcome challenges, direct provisions on permit-granting procedures and energy communities should be better embedded under the ongoing grid modernisation.

C. Minimise disadvantages for energy communities in the European Grids Package

During the ongoing negotiations for the European Grids Package files, the potential disadvantages faced by energy communities must be addressed to prevent this gap from widening further. The barriers mentioned in previous sections, related to financial, technical and capacity constraints, automatically put energy communities at a disadvantage compared to other actors. As highlighted by the European Parliament in its position statement issued prior to the Commission's publication of the package, EU and national funding related to grids should consider the specific needs of projects promoted by energy communities (European Parliament, 2025). In this context, the "first-ready-first-served" principle could also provide meaningful improvement. By relying on transparent maturity criteria for all connection demands, it offers a more efficient alternative to the 'first-come-first-served' approach, which has contributed to the accumulation of long connection queues and deadlocks. This would ensure fairer access conditions for smaller actors, including energy communities. Another option would be to assess legally compliant mechanisms for recognising the specific public-interest characteristics of energy-community projects in grid-access decisions. These could include dedicated capacity windows or transparent prioritisation criteria, provided that they are consistent with non-discrimination and competition requirements (REScoop, 2025). Such a measure would help them reflect their specific purpose, structure, and governance.

D. Investigate smart technologies and microgrids

Energy communities have significant potential to foster innovation and experimentation, particularly by acting as pioneers for smart technologies, including smart grids. Given their small scale, energy communities provide an enabling environment for developing and testing innovative solutions. This potential should **be actively supported by the EU and national governments, including through allocation of dedicated funding**. In the Energy Community Action Plan, the Commission expects to dedicate part of the LIFE Clean Energy Transition funding to support cities and local partners, including energy communities, in implementing smart technologies. These technologies can help optimise local energy sharing and unlock flexibility. For instance, smart grids automatically monitor energy flows and can adapt to changes in supply and demand, thereby significantly enhancing system flexibility (European Commission n.d.a). In addition, some Horizon Europe funding will be redirected to support the development of community-led microgrids and local renewable networks.

Microgrids are typically connected to the public grid at a single point, allowing them to disconnect and operate in 'island' mode. In such cases, electricity flows only within microgrids, potentially reducing congestion on the public grid, and increasing resilience when a blackout occurs. However, this requires sufficient local generation and storage capacity to meet the community's energy demand. Therefore, advanced smart technologies are especially needed for the effective development of microgrid systems. At present, no specific allocation for smart technologies and microgrids has been clearly defined, which risks undermining the actual level of financial support. Therefore, beyond general commitments, both EU and national funding should be mobilised in a clear, targeted and efficient manner to maximise the potential of these innovative technologies.

Conclusions

Based on a literature review, case-study analysis, stakeholder interviews and validation discussions with think tanks, technical experts, civil society organisations, and consumer organisations, this policy paper shows that grid modernisation cannot be conceived just as a technical issue, but it involves a wider distributional and political matter. By integrating energy justice concepts in the analysis, two central questions are necessary to bring forward in the current debate: Who pays, and when? Who benefits and can participate?

The evidence gathered in this study suggests that current EU and national policy frameworks hold potential to systematically address these questions. If, on one hand, the EU has quickly improved and updated its framework to accelerate electrification and grid infrastructure across Member States, on the other hand, the distributional effects of these large-scale investments and their governance are yet to be fully acknowledged. This means that, to date, measures across Member States, such as social bonuses or safety nets, network tariff regulation and broader support to citizens are running in parallel instead of being integrated into a coherent EU framework for a just energy transition.

The considerations made on energy justice should not be treated as complementary to the current priorities in the sector, which are competitiveness, security and decarbonisation. Instead, they are progressively taking the form of a precondition to energy security itself. In other words, if households face rising costs without seeing tangible benefits, and energy communities keep facing barriers in the grid modernisation process, they might generate social resistance, which ultimately undermines the success of the policies for the required energy transition.

Overall, grid planning remains a centralised top-down exercise on a large scale. A fair energy transition requires decentralised actions and active citizen participation. Looking ahead, the success of the energy transition itself does not rely only on infrastructure expansion and modernisation, but also on its social legitimacy, and for that, new policy thinking is needed. Without perceptions of fairness, there is a concrete risk of social resistance, aggravated inequality and eventually policy failure.

In the end, the success of the clean energy transition will depend on both infrastructure modernisation and public support. Social justice is not a side issue for competitiveness and energy security, but rather a key enabler for grid modernisation and a more competitive Europe.

Appendix

Appendix 1: Portugal case study for social tariffs

Portugal follows the standard regulated cost-recovery model (ERSE, 2025), where grid investments are financed upfront by system operators and later recovered through regulated electricity tariffs approved by the national regulatory authority (NRA) in Portugal, Entidade Reguladora dos Serviços Energéticos (ERSE). The tariffs include OPEX, CAPEX, maintenance and losses, financing costs and a regulated return on capital. This means that grid modernisation and expansion costs are ultimately passed on to consumers through electricity bills. Portugal is one of the most vulnerable countries to energy poverty in the European Union (CENSE, 2025). At the same time, interview evidence suggests that most consumers do not understand the different components of their electricity bill and are generally unaware of how network charges contribute to overall electricity costs. This creates an important procedural justice challenge, as consumers ultimately finance grid investments but often have limited understanding of how these costs are recovered. In order to combat energy poverty, Portugal implemented a social tariff, the 'Tarifa Social de Eletricidade' (Direção-Geral de Energia e Geologia, 2016). The tariff provides support for low-income and vulnerable households, with beneficiaries receiving a 33.8 percent discount on electricity charges, including the regulated network access tariff component (Governo da República Portuguesa, 2023). Eligibility is determined automatically based on income thresholds and/or receipt of certain social benefits. More than 12.9 percent of households have benefited from this tariff for electricity, with more than 800 000 households getting the social tariff in 2019 (Horta et al., 2019; Observatoria da Energia, 2019). At the same time, interview evidence suggests that most consumers do not understand the different components of their electricity bill and are generally unaware of how network charges contribute to overall electricity costs. This creates an important procedural justice challenge, as consumers ultimately finance grid investments but often have limited understanding of how these costs are recovered. The scheme currently represents around €130 million per year and is financed collectively through the electricity system (Interview with ADENE). However, policymakers have identified limitations in the targeting mechanism, as some households that qualify based on declared income may not necessarily be experiencing energy poverty. As a result, Portugal is currently reviewing the social tariff framework and exploring additional indicators to better identify vulnerable consumers.

Many lessons can be taken from the social tariff framework in Portugal. The automatic enrolment system that has been set into place significantly increases uptake and the efficiency of the social tariff. The measure demonstrates how affordability concerns can be addressed without fundamentally changing the regulated cost-recovery model used by the TSO and DSOs. At the same time, social tariffs primarily reduce energy bills rather than encouraging more efficient energy consumption or greater participation in flexibility mechanisms (interview with ADENE). As such, they function mainly as a compensatory affordability measure rather than as a tool for demand-side management or grid optimisation. However, there are remaining gaps that need to be addressed. While the tariff reduces the burden of electricity costs overall, it does not specifically address the growing costs of grid modernisation and expansion.

Households, including vulnerable households, still contribute to financing grid expansion because network tariffs remain the main financing tool used by system operators. Network-related costs are becoming increasingly significant in Portugal. Grid charges have risen substantially in recent years and network access costs are becoming more prominent relative to energy costs themselves, reflecting growing investment needs associated with electrification and renewable energy integration (interview with ADENE). EU instruments such as the Social Climate Fund, the Recovery and Resilience Facility, and the Connecting Europe Facility provide support for aspects of the energy transition, but they are not yet systematically used to alleviate the affordability impacts of rising network charges on vulnerable consumers.

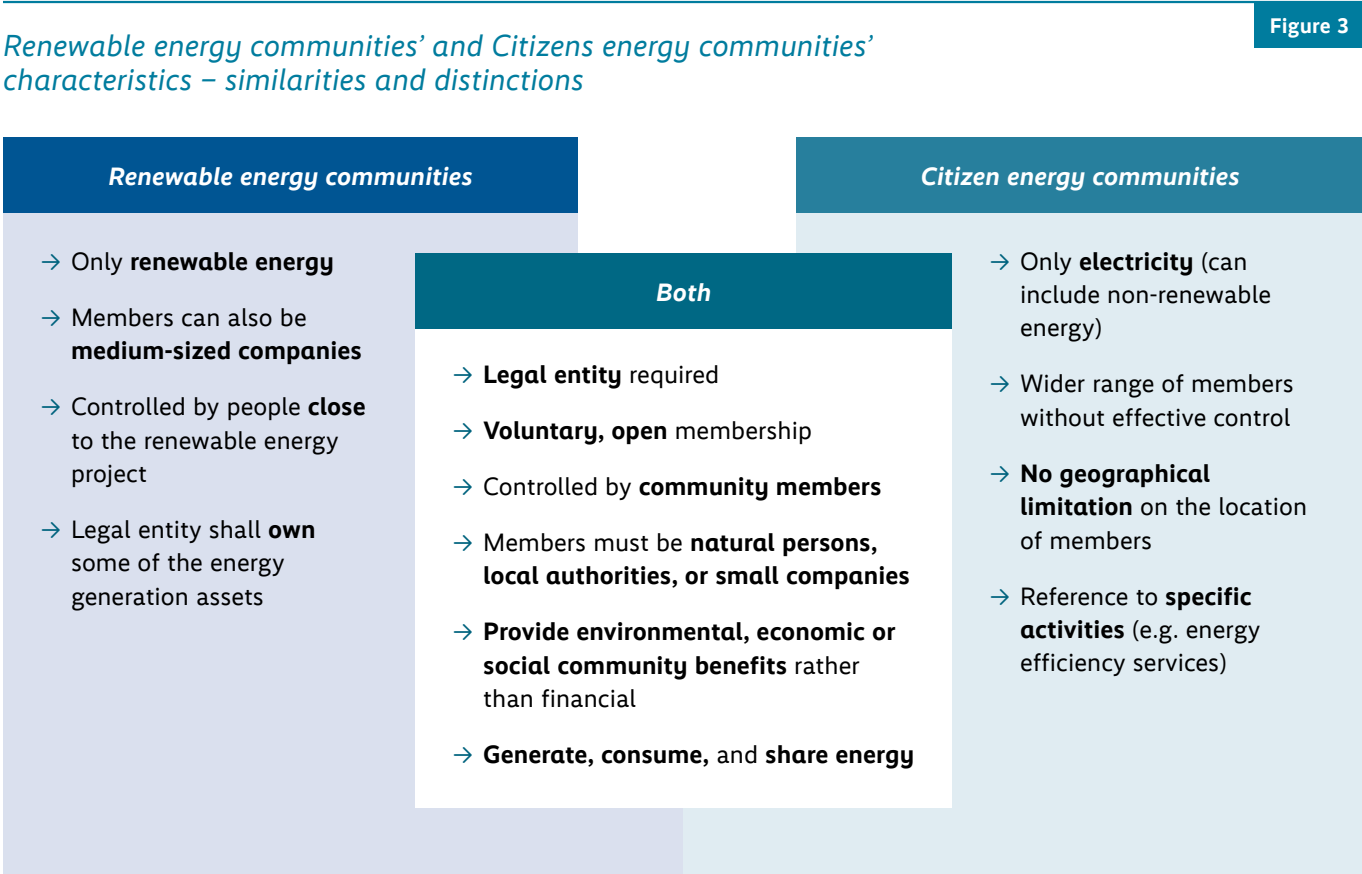
The measure does not resolve the timing asymmetry between immediate tariff increases and delayed benefits from grid expansion. Furthermore, households that are not eligible for the social tariff might still face affordability challenges but may receive limited support. Structural inequalities remain for renters and households unable to invest in renewable technologies such as solar PV that reduce electricity expenditure and reliance. These challenges are compounded by low levels of participation in dynamic tariffs and flexibility schemes. As a result, many households remain poorly positioned to adapt to changing tariff structures or benefit from emerging flexibility opportunities associated with the energy transition.

Appendix 2:
RECs and CECs characteristics

Renewable Energy Communities: Legal entities established under RED II that enable citizens, local authorities, and SMEs to collectively produce and share renewable energy.

Citizen Energy Communities: Legal entities introduced under the Electricity Market Directive that allow citizens, local authorities, and small businesses to participate collectively in energy generation, distribution, storage, and supply.

Figure 3 presents their respective characteristics, highlighting similarities between them, including voluntary and open membership, as well as providing environmental, economic or social community benefits – rather than financial profits. The Figure also clarifies their differences, such as to the proximity to the project the type of energy used.



Source: ECA.2026. based on Directive (EU) 2018/2001; Directive (EU) 2019/944.

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List of abbreviations

ACER	Agency for the Cooperation of Energy Regulators.
ADENE	Portuguese Energy Agency (Agência para a Energia).
ARERA	Italian Regulatory Authority for Energy, Networks and Environment (Autorità di Regolazione per Energia Reti e Ambiente).
CAPEX	Capital Expenditure: Funds invested in acquiring, upgrading, or maintaining physical assets such as energy infrastructure, buildings, or equipment. Typically associated with long-term investments.
CBCECs	Cross-Border Citizen Energy Communities: Citizen-led energy communities that operate across national borders, enabling cooperation in energy generation and consumption by sharing between participants in different Member States.
CBRECs	Cross-Border Renewable Energy Communities: Renewable energy communities whose activities, members, or projects span more than one EU Member State.
CEER	Council of European Energy Regulators: Association of Europe's national energy regulators.
DSOs	Distribution System Operators: Entities responsible for local electricity distribution networks that deliver electricity to end users.
ECA	European Court of Auditors: Independent institution responsible for auditing EU finances and evaluating whether EU funds are spent effectively and in accordance with regulations.
ETS	Emissions Trading System - Directive 2003/87/EC: EU cap-and-trade scheme covering power generation, industry, and aviation sectors. It sets an overall emissions cap and allows trading of emission allowances to reduce greenhouse gas emissions cost-effectively.
ETS2	Emissions Trading System for Buildings, Road Transport and Additional Sectors: A separate EU carbon market scheduled to begin in 2027, covering fuel use in buildings, road transport, and certain additional sectors not included in the original EU ETS.
EU	European Union.
IEA	International Energy Agency.
NRAs	National Regulatory Authorities: Independent regulatory bodies responsible for overseeing national energy markets and ensuring compliance with EU and national energy regulations.
OPEX	Operational Expenditure: Ongoing costs associated with operating and maintaining infrastructure.
PV	Photovoltaic.
RED II	Revised Renewable Energy Directive (EU) 2018/2001: EU directive adopted in 2018 introducing the legal framework for Renewable Energy Communities.
RED III	Renewable Energy Directive III (EU) 2023/2413: Updated version of the Renewable Energy Directive adopted in 2023, increasing EU renewable energy targets and strengthening provisions supporting community energy initiatives.
SCF	Social Climate Fund: An EU fund designed to help vulnerable households, small businesses, and transport users adjust to rising carbon prices under ETS2.
SMEs	Small and Medium-Sized Enterprises.
TEN-E Regulation	Trans-European Networks for Energy Regulation: EU framework supporting the development of cross-border energy infrastructure projects that strengthen market integration and energy security.
TSO	Transmission System Operator: Entity responsible for high-voltage electricity transmission networks and ensuring the secure transport of electricity over long distances.

About the authors

The **Institute for European Environmental Policy** (IEEP) is the only Brussels-based think tank specialised in environmental policy and sustainability. Established in 1976, IEEP has advised generations of experts and policymakers since the very beginning of European environmental legislation. As an independent, unbiased, impartial, and evidence-based institute, we are committed to supporting organisations to better navigate the European environmental policy landscape and advance impact-driven sustainability policy across the EU and beyond. IEEP multidisciplinary team works with EU institutions, international organisations, business, academia, and civil society, providing integrated approaches and multiple perspectives across several research areas and amongst the three priorities: Nature and Sustainable Food Systems, Climate and Zero Pollution. For more information about IEEP, visit www.ieep.eu or follow us on Bluesky and LinkedIn.

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Upgrading the grid, dividing the cost

This policy paper examines the European Union (EU) electricity grid modernisation through a social justice lens, focusing on mitigating household impacts and energy communities. The paper finds that tariff-based grid financing can disproportionately affect vulnerable households, since network charges are unavoidable and investment costs are usually upfront. EU instruments can shield from some harmful effects, but they lack a specific focus on rising network tariffs. The paper also sheds light on the potential role of energy communities to improve affordability, resilience and social acceptance of the transition, while identifying challenges to their uptake and participation.

Further information on the topic can be found here:

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