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Engaging citizens and local communities in the solar revolution

Rooftop Solar PV Country Comparison Report

May 2022

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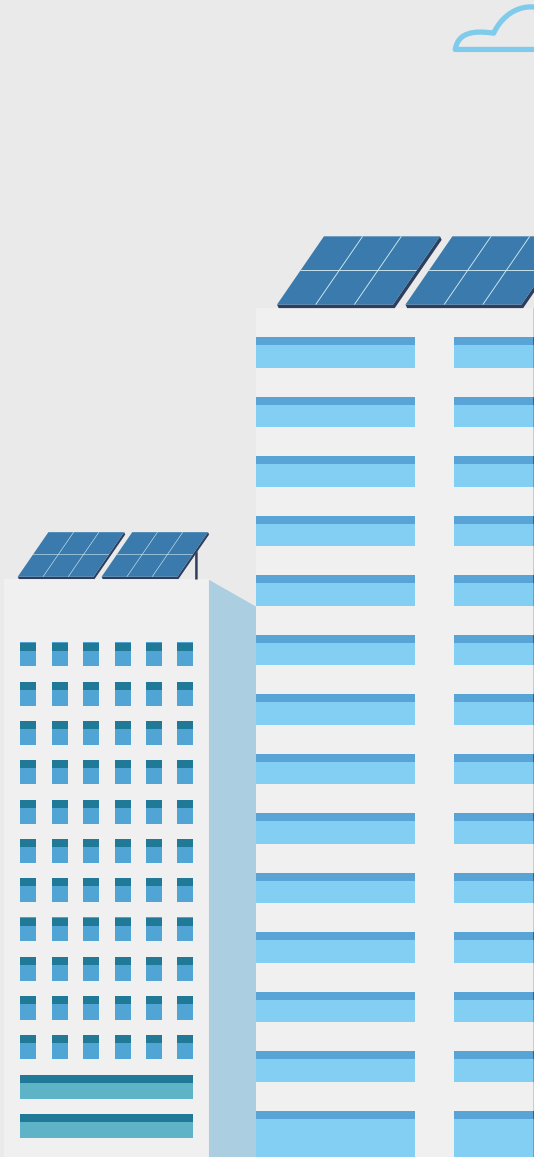


Index

Executive Summary

We are confronting the realities of dangerous and worsening climate change, coupled with the concurring geopolitical and energy security crisis.

We are confronting the realities of dangerous and worsening climate change, coupled with the geopolitical and energy security crisis. The findings of the Intergovernmental Panel on Climate Change (IPCC) clearly signal that we need a rapid phase out of fossil fuels globally to stay within a safe 1.5°C emissions trajectory. The window of opportunity is closing fast for timely action to address the climate crisis and transform our energy systems by strongly reducing energy consumption and massively increasing sustainable renewable energy to achieve a 100% renewable energy system by 2040.

Civil society's Paris Agreement Compatible (PAC) Energy Scenario[1], published by CAN Europe and EEB, **highlights the importance of solar PV to achieve a fully renewable energy system**, making it the **second most important electricity source** by 2030. Yet, **a much stronger commitment to solar PV** in the EU Member States is needed. Total capacity of solar PV is growing in most Member States thanks to the drop in costs while solar targets are included in their National Energy and Climate Plans (NECPs) to meet the 2030 EU target, most of these goals are not ambitious enough, while barriers and bottlenecks have not been clearly identified and the measures to overcome such barriers have not been defined.

A decentralised energy system in which people are empowered as self-consumers (individually or as a part of a group, or community) is an essential part of building a resilient, just, and independent energy system. In a decentralised and democratised energy system citizens and communities can play a more active role in the renewable energy transition and take control of their energy resources. This shift will enable citizens to benefit from the decrease in solar energy costs while addressing the challenge of energy poverty.

A European Joint Research Centre analysis[2] shows that **rooftop PV** in the EU could potentially produce 680TWh of solar electricity annually (representing 24.4% of the electricity consumption based on 2016 levels). Even though there is a lot of potential for solar rooftop PV, the right **regulatory framework** to ensure the full potential and expansion of this technology is not yet in place in every Member State.

In the context of the war in Ukraine, the European Commission has recently proposed the REPowerEU[3] communication to make Europe independent from Russian fossil fuels well before 2030, which among others seeks to accelerate the deployment of renewables. CAN Europe calls for a **"Repowering for the people"**[4] with a number of actions the Commission's 'REPowerEU' plan should feature, including the proposal for a flagship initiative to achieve an annual growth of **at least 5 million new solar PV rooftops by 2025**, through the EU solar energy strategy. This would support Member States in the deployment of solar energy to take the necessary steps, and ensure the current policy framework is improved and the right incentives are in place for a higher uptake of rooftop solar PV.

The report produced by CAN Europe and its member organisations focusing on rooftop solar PV on residential buildings (including both individual and collective self-consumption) shows that there are still significant barriers at national level which impede a higher uptake of rooftop solar PV, and many Member States still lack the right regulatory framework and enabling environment.

1 Paris Agreement Compatible Energy Scenario (PAC), CAN Europe and EEB, 2020
2 Bodis et al, 2019
3 REPowerEU, Communication from the European Commission, 2022
4 Repowering for the People, Briefing by CAN Europe, 2022

Key Findings & Scoring

Governance aspects

Across the 11 Member States assessed in this report, most of the countries lack an adequate road-map/ strategy with clear and ambitious goals and targets for rooftop solar PV. Furthermore, stakeholders and multilevel government views are not often incorporated and the majority of the countries lack institutional mechanisms to support the development of rooftop solar PV.

Incentives: support schemes, taxes and subsidies

While some Member States have a longstanding tradition of supporting rooftop solar PV through feed in tariffs, others have focused more on net billing schemes. Currently, European funds have provided additional incentives including subsidies for solar panels. However, constant changes and revisions in policies on incentives (including taxation) in many countries have harmed the confidence of the sector and its investors.

Permitting and administrative procedures

Still most of the European countries have long, complex and burdensome administrative procedures that disincentivize citizen investment in rooftop solar PV. Construction permits are still required and grid connection procedures are often not transparent enough. A lack of resources for administrative staff, the high number of involved authorities in the permitting processes and the lack of capacity of the grid infrastructure are obstacles that create delays in administrative procedures.

Energy sharing and collective self-consumption

Most EU countries started adapting their national regulations towards the implementation of energy sharing and/or collective self consumption in 2020, mostly for multi-apartment houses. However, only a few of them allow the use of the public grid for this purpose. Furthermore, where it is allowed, there are geographical and size (power) limitations that pose obstacles to collective engagement, as well as majority rules that make reaching agreements difficult.

Energy communities

Many Member States have not transposed the Electricity Market Directive (EMD) and the Renewable Energy Directive (RED) with regard to Renewable Energy Communities (REC) and Citizen Energy Communities (CEC), which were due in December 2020 and June 2021 respectively. Even though some Member States have adopted definitions, most are very superficial and provide very little detail (if any) on the actual principles. Essentially most Member States have copy-pasted the definitions of the directives. Despite adopting definitions, hardly any Member States have put enabling frameworks in place that allow these communities to emerge as requested in the directives.

Additional measures

Additional measures are needed across the Member States in terms of financing training programmes for installers and administrative staff, as well as designing public awareness campaigns that show the benefits and potential of solar PV in order to accelerate its uptake. There is still a large part of the population that does not trust solar PV as a reliable technology. Myths and misconceptions have harmed the sector and play a very significant psychological barrier when investing in solar PV. With regard to smart meters, even though some countries have reached 100% penetration, currently only half of electricity meters in Europe are digital.

Key Policy Recommendations

Governance

- Formulate strategies with ambitious goals and clear targets based on an **assessment of barriers and the potential** for the uptake of rooftop solar PV.
- Create **permanent institutional mechanisms** with the participation of a wide range of relevant stakeholders and governmental levels that contribute to the follow up of rooftop solar PV policy.
- Establish and provide sufficient funding to local and regional renewable agencies and entities which support citizens, SMEs and local authorities.

Incentives: support schemes, taxes and subsidies

- Fully transpose the RED II **entitling renewable self-consumers to receive a stable remuneration, including through support schemes, where applicable,** for the self-generated renewable electricity that they feed into the grid. This should reflect the market value of that electricity and take into account its long term value to the grid, the environment and society.
- **Reduce taxes** to a minimum and subsidise **solar panels**, particularly for energy communities and low income, energy poor and vulnerable households.
- Stimulate self-consumption including promoting **the integration of solar systems with batteries for flexibility**.
- Consider **mandatory solar PV** on all new and renovated buildings, apartment buildings, under certain circumstances, following the energy efficiency first principle.

Permitting and administrative procedures

- Remove construction permits and substitute them with notices or reports on the start of activities for installation of rooftop solar PV.
- Enhance **one stop shop or single permitting procedures** for administrative and grid connection procedures and digitise administrative procedures
- Grid tariffs and network charges should be reduced as far as possible, applicable only to the extent to respect the cost reflective principle
- Introduce a registry of small installations to keep track of the evolution of rooftop PV.

Energy sharing and collective self-consumption

- **Allow for energy sharing** (through the distribution grid) and **collective self-consumption** by transposing and implementing the RED II.
- Reduce to a minimum the proximity and size requirements that pose barriers to energy sharing and collective self- consumption.
- Establish flexible options for stakeholder participation in collective schemes in order to mobilise investment, new business models and the needed social acceptance among citizens.
- Energy sharing and collective self-consumption in apartment buildings or similar structures should be feasible without the need to create an energy community.

Key Policy Recommendations contd.

Energy communities

- **Transpose RED II and the Electricity Market Directive (EMD), including** developing the definitions of renewable energy communities and citizen energy communities and providing comprehensive and coherent enabling frameworks.
- The criteria of the EU definitions should be reflected and developed clearly in detail in national legislation (openness and voluntary participation, autonomy, effective control, geographical proximity)
- Designate an authority to follow up and monitor the implementation of the objectives and provisions for energy communities
- Put policies and measures in place to support the incorporation of energy poor, low income and vulnerable households into the design of both RECs and CECs.

Additional measures

- Launch **awareness campaigns on benefits of rooftop solar PV** to the wider public and ensure easy access to information
- Develop renewable energy **training programmes** for administrative staff, national, regional and local policy makers; as well as support programs to ensure sufficient and well **qualified installers**, energy planners and architects
- Roll out **digital meters** with access to data for energy users to facilitate efficient (collective) self-consumption schemes and grid integration, while ensuring data privacy protection.
- Prepare the distribution grid for a massive roll-out of solar PV and self-consumption, in the context of mobilising all flexibility options.

Acronyms

CEC: Citizen Energy Community
CSC: Collective Self-consumption
DSO: Distribution System Operator
EMD: Electricity Market Directive
EU: European Union
FiT: Feed-in-Tariff
GWh: Gigawatt hours
kW: Kilowatt
LTS: Long Term Strategy
MW: Megawatt
NECP: National Energy and Climate Plan
PV: Photovoltaic
REC: Renewable Energy Community
RES: Renewable Energy Sources
RED II: Renewable Energy Directive II (Recast)

Glossary

Citizen Energy Community: According to IEMD, Article 2(11): "A legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; (c) may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholder".

Energy Sharing: The term "energy sharing" is not further defined in the RED II. We will define energy sharing as a kind of "virtual collective self-consumption through the distribution grid", i.e. across several buildings or from renewable plants to buildings, but still in a local or regional context.

Feed in Tariff: The price per unit of electricity that a utility or supplier has to pay for renewable electricity from renewable electricity generators. The government regulates the tariff rate.

Feed in Premium: Feed-in-premium is a type of price-based policy instrument whereby eligible renewable energy generators are paid a premium price, which is a payment in addition to the wholesale price.

Final energy demand: Final energy is all energy that is delivered to the door of an end consumer, e.g. electricity used in a building, fossil gas that is sent to a household's kettle or delivered energy through a district heat network. Losses from transmission and distribution as well as from conversion of primary energy carriers are deducted.

Net-billing: Net billing is a way to charge but also compensate prosumers based on the actual market value of electricity, balancing the value of what they consume against the value of what they feed into the grid.

Net-metering: Net metering is a billing mechanism that allows prosumers to receive credit for the electricity they feed to the grid that is generated through solar or wind energy.

Prosumer: End-user that consume and produce energy and are integrated in the energy system

Renewable Energy Community: According to RED II, Article 2(16), "A legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits".

Self-consumption: Self-consumption is the activity of using a certain share of power and/or heat generation from self-generation on the premises of a consumer directly to cover the consumer's energy demand. Self-consumption is a central, but not the unique activity within the concept of self-generation. Self-generators may also feed excess electricity into the public grid.

Renewable Self-Consumer: According to RED II, Article 2(14), "A final customer operating within its premises located within confined boundaries or, where permitted by a Member State, within other premises, who generates renewable electricity for its own consumption, and who may store or sell self-generated renewable electricity, provided that, for a non-household renewables self-consumer, those activities do not constitute its primary commercial or professional activity"

Collective Self-Consumption: According to the RED II, Article 21 defines jointly acting renewables self-consumers as" a group of at least two cooperating "renewables self-consumers [...] who are located in the same building or multi-apartment block". In the report we use the term collective self-consumption to refer to "jointly acting renewable self-consumers" in the same building or multi-apartment block or, where permitted by a member state, across several premises in a local context.

1. Introduction

It has become increasingly obvious that our energy system is insecure, heavily dependent on war fueling fossil fuels

We are confronting the realities of dangerous and worsening climate change, coupled with the geopolitical and energy security crisis.

The findings of the Intergovernmental Panel on Climate Change (IPCC)[5] clearly signal that we need a rapid phase out of fossil fuels globally to stay within a safe 1.5°C emissions trajectory. The window of opportunity is closing fast for timely action to address the climate crisis and transform our energy systems by strongly reducing energy consumption and massively increasing sustainable renewable energy to achieve a 100% renewable energy system by 2040. Civil society's Paris Agreement Compatible (PAC) Energy Scenario[6], published by CAN Europe and EEB, **highlights the importance of solar PV to achieve a fully renewable energy system**, making it the **second most important electricity source by 2030**.

It has become increasingly obvious that our energy system is insecure, heavily dependent on war fueling fossil fuels, while forcing the most vulnerable to bear the brunt of higher cost of living driven by increased energy prices. A decentralised energy system in which people are empowered as renewable energy self-consumers (individually or as a part of a group, or community) is an essential part of building a resilient, just, and independent energy system.

In the context of Russia's invasion of Ukraine, the European Commission has recently proposed the REPowerEU[7] communication to make Europe independent from Russian fossil fuels well before 2030. It seeks to accelerate the deployment of renewables, among other measures. **CAN Europe calls for "Repowering for the people"**[8] with a number of actions the Commission's 'REPowerEU' plan should feature, including the proposal for a flagship initiative to achieve an annual growth of **at least 5 million new solar PV rooftops in 2025**, through the EU solar energy strategy. This would support Member States in the deployment of solar energy to take the necessary steps, and ensure the current policy framework is improved and the right incentives are in place for a higher uptake of rooftop solar PV.

Solar PV rooftops have enormous potential and installations can be built out quickly, enabling households' to shift from being mere consumers of energy to "self-generators" putting the control of electricity production back in their hands and making them active participants in the renewable energy transition. A European Joint Research Centre (JRC) analysis[9] shows that rooftop PV in the EU could potentially produce 680TWh of solar electricity annually (representing 24.4% of electricity consumption[10]).

Furthermore, investments in the solar sector generate the most jobs per million euros of capital investment and can be implemented in a short timeframe, in particular on rooftops[11]. On top of enormous benefits for households from lower energy bills to clean and affordable energy, PV systems on rooftops do not compete with land use, and their integration into the electricity system is relatively easy due to their proximity to the point of consumption.

Interest in solar electricity generation with and without storage for self-consumption, as well as systems on apartment buildings, is gradually increasing. In 2020, solar renewable energy supplied 5% of the EU's electricity mix, up from 3% in 2015. After years of slow installation rates in the EU, figures started to rise in 2018, reaching 20 GW installed in 2020 during the Coronavirus pandemic, despite the challenging circumstances. This made 2020 the second-best year ever for solar in the EU, only topped by 2011, when 21.4 GW was installed[12].

However, **a much stronger commitment to solar PV** in the EU member states is needed. Total capacity has grown in most Member States thanks to the drop in costs, and solar targets have been included in National Energy and Climate Plans (NECPs) to meet 2030 EU targets. However, most of these goals are not ambitious enough, barriers and bottlenecks have not been clearly identified and the measures to overcome such barriers have not been defined.

5 IPCC Sixth Assessment Report, 2022
6 Paris Agreement Compatible Energy Scenario (PAC), CAN Europe and EEB, 2020
7 REPowerEU, Communication from the European Commission, 2022
8 Repowering for the People, Briefing by CAN Europe, 2022
9 Bodis et al, 2019
10 Based on 2016 levels
11 IEA, 2020
12 SolarPower Europe, 2020

A recent report[13] showed that currently, no EU Member State has fully adequate policies to ensure the necessary deployment of solar PV and wind energy during the next decade and beyond. **Barriers related to administrative processes and political and economic frameworks** were shown to block developments in Europe. Barriers include high complexity, long duration and low transparency of administrative procedures and issues connected to support schemes and lack of related strategies. Even though there is a lot of potential for rooftop solar PV, the right **regulatory framework** to ensure the full potential and expansion of this technology is not yet in place in every Member State. Action should be taken immediately to task Member States to put in place ambitious and comprehensive plans that ensure barriers are removed for all buildings (residential, industrial, communal) in the short term and the right incentives are in place for massively scaling up rooftop solar PV.

It is important to detect and **overcome barriers at national level** and make sure the right incentives are in place for a higher uptake of rooftop solar PV. It is also necessary to highlight good and bad practices and identify the key factors of success for setting up the right regulatory framework.

1.1. Scope and objectives of the report

This report and the accompanying country sheets[14] are produced by CAN Europe and its member organisations in eleven Member States (Bulgaria, France, Germany, Greece, Italy, Latvia, Lithuania, Portugal, Romania, Sweden, and Spain). It covers and focuses on **residential buildings** (individual and collective self-consumption) to allow for comparison of approaches among different countries. This is congruent with the decentralised and democratised energy model promoted by the clean energy package, where citizens and communities can play a more active role and take control of their energy resources. The focus on residential building rooftops, as the citizen's most accessible space, seeks to highlight the importance of the empowerment and engagement of community members as a paramount factor that will contribute to boost proliferation of solar PV rooftops across Europe, without leaving behind other very significant sectors such as the industrial or the commercial ones. This shift will enable citizens to benefit by the decrease in solar energy costs while addressing the challenge of energy poverty.

The report focuses on legal, administrative and support measures, leaving aside other technical aspects such as the integration of solar systems with batteries[15].

It covers:

- Governance
- Incentives: support schemes, taxes and subsidies
- Permitting and administrative procedures
- Energy sharing and collective self-consumption
- Energy communities
- Additional measures to support the development of rooftop solar PV such as awareness raising campaigns, training programmes and the roll out of smart meters.

13 Eclareon, 2022
14 https://caneurope.org/rooftop-solar-pv-comparison-country-profiles/
15 The use of batteries is one of the flexibility options. They encourage consumers to use their own energy and therefore reduce pressures on balancing demand and supply in grids.

2. Governance

Identifying the obstacles that may slow down or impede a massive scale deployment.

This chapter includes recommendations, barriers, good and bad practices related to governance aspects, including developing a roadmap/strategy with clear and ambitious goals and targets, the incorporation of stakeholders and multilevel government views and the existence or not of institutional mechanisms to support the development of rooftop solar PV.

2.1. Policy recommendations

- A **road-map/strategy** should be elaborated with the **involvement of relevant stakeholders**.
- The roadmap/strategy should include **ambitious and clear targets**. Action plans should include annual milestones with specific and ambitious sub targets, disaggregated by system size, or distributed versus utility-scale installations.
- The targets should be based on a thorough **assessment of the barriers and the potential** for rooftop solar PV.
- The **assessment** should take into account **geographical, physical, technical and economical barriers**, and **qualitative** ones such as lack of information, nonalignment between owners and tenants, conflicts among neighbours, lack of consensus when addressing energy sharing or collective self-consumption and a lack of awareness/myths among consumers on the reliability of solar PV.
- The implementation of the strategy should be **followed up by a permanent institutional mechanism** with the participation of a wide range of relevant stakeholders and governmental levels.
- Establish and provide **sufficient funding for local and regional renewable energy agencies** and entities which support citizens, SMEs and local authorities with expertise and with the clear mandate to increase the share of renewable energy in their areas

2.2. Rationale

Solar PV targets are included in National Energy and Climate Plans (NECPs) to meet the 2030 EU renewable energy target. However, **most of these goals are not ambitious enough**, while barriers and bottlenecks have not been clearly identified and the measures to overcome such barriers have not been defined. In order to make the national strategy effective and straightforward, it should be **based on a thorough assessment of the potentials and barriers** for the deployment of rooftop solar PV, identifying the obstacles that may slow down or impede a massive scale deployment.

Obstacles to the development of rooftop solar PV differ to ground-mounted solar projects, which imply longer administrative procedures and permitting processes, require additional verification and impact assessments on potential alternative land uses (agriculture, biodiversity, etc.) and higher financial support. There are **specific bottlenecks in residential rooftop solar PV**, such as: the need for majority rules in collective self-consumption that do not pose obstacles to reaching agreements; a lack of experience and expertise of Distribution System Operators (DSOs) and energy suppliers when dealing with a higher, diversified, not always geographically concentrated, and a large number of producers; making solar PV accessible for tenants or vulnerable households; and lack of awareness of the benefits of solar PV among the population. These specific factors have to be incorporated in a detailed assessment together with other geographical, technical and economical barriers, otherwise the strategy could risk being ignored. Without a reliable and long-term strategy for renewable energy sources. clear sector targets and a consistent regulatory framework at national level, solar PV will inevitably stall1.

Targets should be based on appropriate assumptions and be ambitious enough, otherwise **lack of ambition in the formulation of the goals could create a disincentive** for all the actors involved. The relevant stakeholders should be included in the formulation of the strategy, giving enough time for consultation procedures and creating the necessary framework so their role is respected and their opinions incorporated. They should also be incorporated in a **follow up institutional mechanism** to ensure the implementation of the strategy. Usually after the approval of the legal framework, several implementation issues come up regarding the permitting process, communications and protocols among DSOs and energy suppliers, etc. which need to be addressed with the right cooperation mechanisms in order to ensure removal of bottlenecks and hurdles. Without the existence of such cooperation mechanisms, it may be difficult and slow to solve issues that require such a level of exchange of information.

Finally, **capacity building activities should be enhanced and the appropriate budget** distributed among local and regional renewable energy agencies, so that citizens, SMEs and local authorities have access to technical and financial support in their areas.

2.3. Barriers

2.3.1. Lack of strategy

Very few countries have approved a road map/strategy that contains specific goals and actions for rooftop solar PV besides their NECPs. Out of the countries selected for this report, the **Spanish Government**, after pressure from NGOs and with a two year of delay, has approved a roadmap for self-consumption which will become a strategy in the near future. In France, the framework for developing photovoltaic policies falls within the long term National Low Carbon Strategy[17] and the 10-year Energy Programme Decree.

Even though most of the countries have established the solar target for 2030 in their respective NECPs, indicating intermediate trajectories in terms of yearly capacity targets, most of the plans are not disaggregated by system size, or distributed versus utility-scale installations[18]. **Sweden does not** have an approved roadmap or strategy, but there are some reports by the Swedish Energy Agency including aspects on potential, barriers, roadmaps, etc.[19]. The Draft Energy Strategy of **Bulgaria** to 2030/2050 and the NECP to 2030 do not set a meaningful road-map or plan, where rooftop installations in the NECP are not mentioned much.

2.3.2. Lack of ambition and follow up

The differences in quality and amount of information about solar targets in NECPs are remarkable. In **Spain**, there is a lack of ambition for the installed capacity targets for 2030 due to the high electricity prices (the CNMC, the Spanish energy regulator itself, warned the Government that the 2030 targets would already be reached in 2025). Furthermore, there are no binding targets and no initial or intermediate dates for the elimination of each of the proposed barriers. There are no procedures or dates for the monitoring of the measures set out, nor for the elimination of barriers, especially the limit of 500 meters between generation and consumption for collective self-consumption, which is very restrictive, especially in rural areas. **Portugal** has no specific roadmap strategy for rooftop-PV, only the general National Energy and Climate Plan (NECP)[20] and the Long Term Strategy[21] (LTS) for Carbon Neutrality . The NECP points to 2,000 MW of decentralised solar PV in 2030, as opposed to 7,000 MW of centralised, whereas the LTS points to 13,000 MW both centralised and decentralised in 2050. These objectives are far below the technical and economic potential of solar in the country. **Greece's** NECP sets a target of having over 600 MW of power needs covered through self-consumption and net metering schemes by 2030, to reach over 1 GW of installed capacity that will cover the electricity needs for 330,000 households[22]. **Germany** has created a sound environment for rooftop solar PV. The new Coalition agreement 2021-2025 has set specific targets for solar: photovoltaic expansion is to be accelerated in the future, with the new government's stated goal of approximately 200 GW by 2030. This doubling of the previous

17 SNBC, 2050 horizon
18 SolarPower Europe, 2020, p.30
19 www.energimyndigheten.se
20 Portugal's National Energy and Climate Plan, December 2019
https://ec.europa.eu/energy/sites/ener/files/documents/pt_final_necp_main_pt.pdf
21 Long Term Strategy For Carbon Neutrality of the Portuguese Economy by 2050, 2019,
https://www.portugal.gov.pt/download-ficheiros/ficheiro.aspx?v=%3d%3dBAAAAB%2bLCAAAAAAABACzMDexBAC4h9DRBAAAAA%3d%3d
22 Ministry of the Environment and Energy of Hellenic Republic, "Greece's National Energy and Climate Plan," no. December, p. 335, 2019

goal would mean that approximately 140 GW of solar PV energy would have to be installed in Germany over the next years, corresponding to an annual expansion of 15 GW.

Another positive example is **France's** NECP which incorporates self-consumption and energy communities, setting a target of 200,000 PV sites for self-consumption in 2023, 50,000 of which are collective[23]. The current Energy Program Decree in France, published in 2020, targets 3 GW to 5 GW per year of new capacity, to reach 20 GW by 2023 and 35 - 44 GW by 2028. The **Bulgarian** integrated plan on energy and climate for 2021-2030 (the Integrated Plan) provides for the development of the renewables sector to 27% of the gross final consumption and therefore the Bulgarian Government is expecting that the installed capacity of PV in Bulgaria will triple by 2030[24].

2.3.3. Lack of involvement of stakeholders

A national round table for self-consumption will be set up in **Spain** with the participation of different departments from the National Government, the Energy Regulator (CNMC), Autonomous Communities and Local Entities[25]. A Working Group will also be created with Local Entities where private associations will be allowed to participate. The focus of the Working Group will be simplification of administrative processes. These two measures are foreseen in the Roadmap for Self-Consumption. However, the consultation **process of the Roadmap in Spain was not visible enough** and adapted to the capacity of stakeholders to provide feedback taking existing human resources into account. In fact, the time to analyse and propose amendments was too short. According to some stakeholders involved, the public consultation was neither effective nor useful, as the authorities in charge were not open to major modifications. Most of the other countries have included stakeholder participation only through the law consultation processes. **Lithuania**, on the other hand, has reported regular engagement of stakeholders with the government regarding solar PV policies.

2.3.4. Lack of coordination with and support for other levels of government

Planning should not only be done according to the national perspective. It should incorporate feedback from municipalities and other governmental levels, while using the European and national funds to provide capacity building and training for local energy agencies and regional and local entities. In **France**, for instance, although the law has progressively recognised the key role of the intermediate levels in the development of renewable energies, local authorities still lack the appropriate tools to develop solar energy on a massive scale (modulation of feed-in tariffs for example). The next ten-year energy program should be more coherent with regional and local plans and with the commitment of local actors in this sense.

2.4. Practices

2.4.1. Bad practice

Latvia

Latvia's NECP has set the goal to increase the share of RES to 50% in 2030. However, Latvia is the only country that does not include solar targets in its NECPs[26].

2.4.2. Good practices

France

The **French** government has signalled a real desire to meet the 10 year energy program targets, publishing an Action Plan in November 2021 to accelerate the development of photovoltaics. This plan includes a possible feed-in tariff for ground-mounted PV installations under 500 kW on wasteland, 1,000 projects on public land and buildings, a reduction in upfront grid connection costs and simplifications of administrative procedures.[27]

23 Government of France, "INTEGRATED NATIONAL ENERGY AND CLIMATE PLAN for FRANCE," 2020. Available: https://ec.europa.eu/energy/sites/ener/files/documents/fr_final_necp_main_en.pdf.
24 Renewable energy law and regulation in Bulgaria | CMS Expert Guides
25 https://www.idae.es/tecnologias/energias-renovables/oficina-de-autoconsumo.
26 Eclareon, 2022, p.5
27 https://www.ecologie.gouv.fr/solaire

Germany

The coalition agreement between Social Democrats (SPD), the Green Party, and Free Democrats (FDP) was published on November 24, 2021. It has a strong climate and energy focus. The agreement includes concrete steps such as a massive expansion of renewable energy sources. There is a recognition that energy produced by citizens is an important pillar to the acceptance of the energy transition. Furthermore, they want to reduce bureaucracy particularly up to specific thresholds. On top of that, they aim to revise the relevant charges, levies and taxes in order to foster and to simplify the renewable energy supply in the districts.

Spain

In **Spain**, a road map for self-consumption[28] was approved by the Spanish Government in December 2021. The National Energy and Climate Plan also foresees the approval of a National Strategy for Self-Consumption (the road map is a first step in this process).

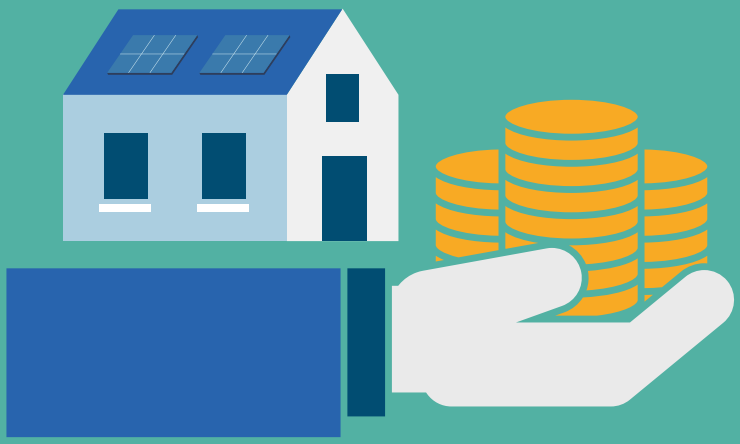
Despite some shortcomings, the Roadmap includes more than 30 measures to promote self-consumption and "aims to identify the challenges and opportunities of self-consumption to ensure its massive deployment in Spain, as well as to eliminate existing barriers to its implementation and promote its development in all productive sectors". The assumptions on which the goals are defined are well formulated using multiple sources of data and information: the urban cadastre, power density and generation curve assumptions, electricity prices, demand for type of consumer, payback and other more qualitative barriers such as lack of information, non-alignment between owners and tenants, conflicts among neighbours, etc. It uses a waterfall approach that firstly takes the physical and geographical potential into account; secondly the technical potential; thirdly the economical potential and finally the real potential based on the above mentioned data sources. The measures foreseen are holistic and tackle the relevant challenges: improving institutional collaboration, training programmes, awareness raising campaigns, strengthening the value chain, legal reforms, increasing flexibility, easing the dynamic distribution of electricity, improving decision making in collective self-consumption (CSC), enhancing energy communities, improving communication with and among electricity suppliers and DSOs, easing access to the grid and others.

Lithuania

In **Lithuania**, quarterly meetings between the minister of energy and solar PV business representatives and some NGOs are held in order to exchange information on future plans and actions of the ministry of energy and get feedback from the market participants and civil society entities.

28 https://www.miteco.gob.es/es/ministerio/planes-estrategias/hoja-ruta-autoconsumo/default.aspx

3. Incentives, taxes, subsidies and support schemes



Member states should include specific measures to entitle self-consumers to receive renumeration

This chapter includes recommendations, barriers, good and bad practices related to incentives for the development of rooftop solar PV rooftop, including feed-in-tariffs and feed-in premiums, tax reductions, subsidies or other incentive mechanisms that enhance solar PV proliferation among European countries.

3.1. Policy recommendations

- Even though the price of solar PV is already very competitive, Member States should include specific measures to **entitle self-consumers to receive remuneration**, including where applicable, **support schemes** for the self-generated renewable electricity that they feed into the grid.
- Depending on the national circumstances and specific needs, support schemes such as **feed-in tariffs and feed-in premiums** can be still useful to accelerate the uptake of rooftop solar PV if well managed with consistent monitoring and adjustment. Under different national contexts, other support schemes such as **net billing or subsidies** for solar PV can be more useful to make rooftop PV viable and easy-to-understand business case, thereby enable its faster and wider uptake.
- It is crucial that the surplus power fed into the grid is **remunerated or valued** at sufficiently high tariffs so that prosumers and energy communities make full use of the available rooftop space. In some Member States, it might be necessary to adapt support schemes to the size (power) of the installation and **geographical area**, providing more support for smaller installations and areas with less sunshine in order to make them competitive.
- Support schemes should be stable and **avoid revisions** that create distrust in the market and make potential investors hesitant towards new investments
- Small scale and/or citizen driven installations should be exempt from competitive bidding.
- Self-consumption should always be stimulated, promoting the integration of solar systems with batteries, which are highly recommended as one of the flexibility options and can, for instance, store the electricity solar panels have generated during the day to use it at night.
- Applicable **taxes** should be **reduced** to a minimum.
- Current available **European and national funds** should be wisely used to subsidise the installation of rooftop solar PV. **Low income households and energy communities,** who lack access to the financial market and cannot receive bank loans, should be **specifically targeted**. For instance, tools such as a guarantee fund for energy communities or long-term funds aimed at low-income households to encourage the construction of solar PV should be promoted.
- European and national funds should promote a holistic integrated approach with regards to building renovation, acknowledging the contribution of on-site renewable solutions and rooftop solar, in particular to achieve a higher operational energy performance, and secure affordable electricity supply for vulnerable consumers.
- Consider **mandatory solar PV** on all new and renovated buildings and apartment houses under certain circumstances, following the energy efficiency first principle. It could also include parking lots and other infrastructure.

3.2. Rationale

Depending on the national circumstances and specific market needs, **feed in-tariffs (FiT) and feed-in-premiums (among other support schemes)** can still be very useful tools to promote expansion of solar PV. This has been already shown in the past, particularly in countries like **Germany**, where an incentive system based on a state-guaranteed feed-in remuneration was probably one of the drivers of what we call the first boom in solar PV. Feed-in tariff policies guarantee access to the network, provide stable and long-term purchase agreements (15-20 years) and payment above the costs of renewable energy generation, thus offering a very secure and stable market for investors. On the other hand, a feed-in premium offers a premium above the average spot electricity

market price, which distinguishes them from the fixed-price FiT payment structure. These approaches, together with other support schemes, are coherent with the fact that **solar PV is a positive externality**, which benefits society reducing both CO2 emissions and dependence on external and more polluting energy sources. In the case of solar rooftop PV, it enables a households' to shift from being a mere consumer of energy to a "self-generator" putting the control of electricity production back in their hands and making them active participants of the renewable energy transition.

According to the Renewable Energy Directive (RED II) , self-consumers are entitled to receive remuneration, including through support schemes, "which reflects the market value of that electricity and which may take into account its long-term value to the grid, the environment and society." **These tools should be further promoted and enhanced.**

Limitations like "breathing caps"[29], a policy instrument introduced with the 2012 Renewable Energy Sources Act in Germany to reduce the feed-in tariff rates for PV installations, have negatively impacted the expansion of solar PV and should be discontinued. On top of this, citizens and small installations should be **exempt from competitive bidding**, since it is too costly for them. It also requires too much paperwork and access to financing that usually is non-existent for these initiatives, it entails high investment risks and it is difficult to compete with larger market players. This is aligned with the new European energy and environmental State aid guidelines, which allow small initiatives up to specific thresholds.[30]

However, financial crises have made governments revisit and drastically reduce support schemes, creating distrust among investors. There are abundant examples in the European Union: Spain, Greece, Bulgaria, etc. Therefore, stability of the support schemes is key to creating a trusting business environment.

Currently, at a more general level, there is a **shift in European countries from public support schemes like feed-in- tariffs to the promotion of self-consumption** or private power purchase agreements (PPAs). **Declining costs have** allowed these models to become much more economically viable over the past decade, but they are still underdeveloped due to a wide range of reasons in particular a lack of knowledge as well as legal and administrative barriers[31]. In this context, the integration of solar panels with batteries offers more flexibility (as one of the flexibility options) to consumers in order to take advantage and use the full potential of the electricity they generated.

Taxation should be avoided as far as possible since solar PV is clearly a positive externality and taxation represents an economic barrier to its development. Examples such as the "sun tax" in Spain (currently non operative), show the impact that taxes may have slowing down or almost totally paralysing the development of solar PV. Finally, funds available in the EU's Recovery and Resilience Facility, regular cohesion policy funds, and other national funds, should be used to maximise the financial resources dedicated to energy efficiency and renewables overall, while targeting and prioritising those citizens and entities that do not have easy access to financing, meaning vulnerable households and energy communities. Indeed, poorly designed support schemes that fail to prioritise vulnerable households may indirectly exacerbate the current existing energy divide among wealthy and vulnerable households (accentuated by the increase in electricity prices). Conversely, well targeted support schemes could both be cost effective in maximising energy savings and renewable energy penetration and increase the social acceptance of renewables.

Finally, **mandatory solar PV requirements** for new buildings and renovations will help to create the necessary momentum to speed up processes particularly in those countries where small-scale solar PV has not yet emerged.

29 The idea is that at a time when the market is growing fast and when large numbers of renewables installations are being built, feed-in tariff rates will be reduced more quickly than at a time when the market is growing more slowly and smaller numbers of renewables installations are being built.

30 TSee: https://friendsoftheearth.eu/publication/auctions-energy-communities-why-central-energy-transition/ and https://www.rescoop.eu/toolbox/rescoop-eus-response-to-the-consultation-on-the-eeag-and-gber-revision

31 Eclareon, 2022, p.22

3.3. Barriers

3.3.1. Absence of support schemes or lack of adequacy

Countries with generous solar and renewable support schemes have been more successful. **Germany**, which is currently the largest solar market in Europe, is the best example. It has occupied that position for most of the time last 20 years. However, reductions in the remuneration rates and policy tools like the "breathing cap"[32] have stifled the expansion of rooftop photovoltaic systems. The remuneration for the electricity fed into the grid is now too low. Although it is planned that remuneration rates for smaller scale PV roof systems will increase again with the planned EEG amendment, there is still room for improvement. Depending on the national context and market needs, a secure feed-in-tariff at an attractive level- without a breathing cap- is a good tool to promote small and medium-size. In countries like **Portugal**, where there is no feed-in-tariff or feed-in-premium (surplus is sold at market price), it becomes more difficult to make economically viable rooftop projects to sell to the network, even with the recent improvements in the legal framework. In these cases, the lack of predictability of revenue makes it very challenging to prove the financial feasibility of the project to the banks. Finally, incentives should be adequate and variable depending on the size of the installation.

In **Italy**, the model used for energy communities in the experimental phase rewards only the shared energy through a single and unique tariff that does not consider the size (power) of the plants. This means smaller plants face difficulties making their installation economically viable. In this context, smaller projects only achieve viability if associated with other existing incentives (such as tax deductions or subsidies) which usually only have a temporary duration. In **France**, the absence of a modulated feed-in tariff to adapt the support to the territorial context (France is the European country with the largest sunshine differential between the north and south of France) is detrimental for some projects, particularly energy communities. Projects that are "profitable" in the south are not easily profitable in the north under the same support tariff.

3.3.2. Poor planning and lack of stability

Frequent modifications in national legal frameworks in recent years have destabilised the market. In countries like **Greece** and **Spain**, the first feed-in-tariff programmes for rooftop solar were quite successful creating a big wave of new PV installations on rooftops due to the generosity of the tariffs. However, the revisions of the programme created distrust in the solar market, making potential investors hesitant towards new investments under similar subsidy schemes and many of them went bankrupt. In **Greece**, the old FiT scheme started in 2009 with a Special Photovoltaic Development Program for low power systems[33], with a very high tariff (0.55 Euros/kWh) for up to 10kWp rooftop PV. This price was reduced from 2013 which led to a decrease in the interest for the Fit scheme particularly after 2014 when the net metering scheme was introduced.

In **Italy**, stop-start policies on incentives for renewable energies linked to continuously changing governments in recent years have harmed the sector's confidence.[34] In France, the feed in tariff (FiT) for PV installations below 500 kW on buildings is subject to revisions every three months depending on the number of completed grid connections, which is perceived as a destabilising factor by promoters, since they cannot have a clear idea of their payback period.[35]

3.3.3. Issues related to net metering/billing

Even though the EU legal framework for renewable energy sources and electricity markets contained in the Clean Energy Package fails to explicitly address net metering, more Member States are resorting to net metering and net billing regimes as a fundamental tool to support decentralised energy generation (especially solar PV). Net metering regimes entail many variations across different contexts, depending on objectives, ambition and level of maturity.[36]

In **Spain**, a net billing is made between the surplus energy generated and the deficit consumed from the network. Non-self-consumed energy would offset part of the energy that had to be purchased from the

32 The idea is that at a time when the market is growing fast and when large numbers of renewables installations are being built, feed-in tariff rates will be reduced more quickly than at a time when the market is growing more slowly and smaller numbers of renewables installations are being built.
33 Official Gazette B' B 1079/04.06.2009
34 Eclareon, 2022, p.22
35 Eclareon, 2022, p.24
36 Iliopoulos et al, 2020

grid, at the freely agreed price with the chosen supplier or the hourly average price of the electricity market (maximum installed capacity is 100 kW). In **Latvia**, recent improvements in the metering system for private microgeneration (only applied to natural persons and effective from April 1, 2020) allow unused solar electricity to be retrieved from the grid within one year.[37]

In **Greece**, excess energy from PV installed on the premises of the consumer (including rooftops) can be used later to offset consumption when PV generation is not available. The netting period is three years. Beyond the three years any excess electricity produced is not compensated. For residential systems, the maximum installed capacity is 20kW. Even though such a net-metering scheme seems attractive and is gaining momentum, interest from residential consumers remains relatively low in Greece. The new installed capacity in 2021 (38MW) more than doubled compared to the previous year (17MW), reaching a total of 89MW of PV systems installed under the net metering scheme (including virtual net metering). However, only 4% of this accounts for residential installations[38,39]. In **Portugal**, solar PV on rooftops are difficult to run on self-consumption, partly due to the instantaneous net-metering regime which means that self-consumption only happens if the energy is consumed at the same instant as it is being produced (in periods of 15 minutes) and surplus is not valued nor discounted in the bill (only real time production).

In most of the above mentioned cases, no remuneration is foreseen. Economic benefits come only from compensating electricity production and compensation. However, in **Italy** the mechanism of "Scambio sul Posto" ("On-site Exchange"), is a form of economic compensation between inputs and withdrawals. Under this scheme, the electricity generated by a self-consumer in an eligible on-site installation and injected into the grid can be used to offset the electricity withdrawn.. If at the end of the year the value of the energy introduced in the network is greater than the value of the energy withdrawn from it, the prosumer will receive the difference in euros from the GSE (the National Manager of Energy Services). This mechanism has been acknowledged as instrumental for the uptake of residential solar PV in the Italian market[40]. In fact, combined with tax deductions (up to 50 percent) on the installation of solar panels, this has led to a remarkably high level of profitability and low payback period for residential solar PV, as compared to other support schemes in the EU[41]. At the moment, however, this incentive system is under review and its possible elimination is under discussion.

3.3.4. Taxation

Tax systems should not discourage the uptake of rooftop solar PV. In some cases, such as in **Germany**, electricity storage capacities are taxed twice, as they are considered to be both energy producers and end users.[42] However, with the new "Easter package" proposal[43], it looks like **Germany** will be adopting a more favourable tax policy, and the EEG surcharge is supposed to be removed. In **Latvia**, there are no tax incentives for self-consumption[44]. In other countries, different taxation approaches have been adopted depending on the size of the installation. In **Romania**, due to new legislative reforms, individual prosumers (physical persons) with a maximum of 400kW installed power are exempt from taxes for the self- consumed energy and for the energy which is sold to suppliers; and both companies and physical persons that act as prosumers no longer need to buy green certificates for the electricity they produce.[45]

In **Spain**, even though not operative any more, the former "impuesto al sol" or solar tax, removed in 2018, was a toll or tax that the authorities asked for to cover the costs of distribution and maintenance of the electricity network in any self-consumption installation of more than 10 Kw connected to the grid. This tax, together with the former self consumption regulation that required the self-consumer to qualify as a producer (with all the necessary paperwork, authorisation, payment of taxes, etc) had a very negative impact on the development of solar PV in the country. Currently, as a positive change in Spain since 2019, the self-consumer does not have to pay VAT and electricity taxes in the simplified compensation modality explained above, where a net billing is made between the surplus energy generated and the deficit consumed from the network. In this modality, the

37 PV policy developments in the Baltic states – pv magazine International (pv-magazine.com), accessed 12/4/2022
38 https://helapco.gr/nea-2021/statistika-ellinikis-agoras-fotovoltaikon-2021/
39 HELAPCO, https://helapco.gr/statistika-ellhnikhs-agoras-fwtovoltaikwn/
40 Iliapoulos, 2020
41 De Boeck et al, 2016
42 Eclareon, 2022
43 Ministry of Economic Affairs and Climate Action, April 2022, https://www.bmwk.de/Redaktion/DE/Downloads/Energie/0406_ueberblickspapier_osterpaket.html
44 Eclareon, 2022
45 ORD DE URGENTA 143 28/12/2021 - Portal Legislativ (just.ro)

maximum installed capacity is 100 kW and no remuneration of surpluses is possible, only compensation of the electricity bill. In **Sweden**, there are also positive approaches to taxation such as an (income) tax reduction of 0,6 SEK/kWh for feed-in electricity up to the amount that is bought, for connections up to 100A.

3.3.5. Implementation of EU and national funds

The EU's recovery plan, **Next Generation EU**, which aims to accelerate Europe's green and digital transition under the form of loans, grants or state guarantees represents an opportunity to accelerate the deployment of solar PV in Europe. However, these measures should target those entities and citizens that do not have easy access to financing. Citizen driven projects need both financial and technical support since their projects are not bankable, while their contribution to the reduction of CO2 emissions is much needed. In Romania, there is a financing scheme of €4000 to cover 90% of an investment in a PV system of minimum 3kW. This is for citizens who want to become prosumers. However, because of multiple bureaucratic bottlenecks, this programme only produced around 10,000 prosumers in three years, although it could have produced at least 3-4 times more (the state did not manage to use all the European funding available). As positive examples, in **Italy**, the PNRR (National Recovery and Resilience Plan) has allocated €2.2 billion to support the creation of energy communities in small Italian municipalities, i.e., those with a population of less than five thousand residents.[46] The **Spanish** government announced €100 Million in grants to boost Energy Communities in three programmes: Energy Communities Learning; Energy Communities Planning; and Energy Communities Implementing[47]. These funds could be conditioned to the **adoption of an integration approach with regard to building renovation under some circumstances**. This would acknowledge the contribution of on-site renewable solutions and rooftop solar in particular to achieve a higher operational energy performance, and secure affordable electricity supply for vulnerable consumers.

3.4. Practices

3.4.1. Bad practices

France

In **France**, the ban on accumulating local aid with the feed-in tariff in the latest tariff decree of 6 October 2021 poses many risks for local project developers and is likely to put a major brake on the development of energy communities.

3.4.2. Good practices

Italy

The current available funding programmes in Italy are the following:

1. **Cessione del Credito (Credit Transfer):**
   Offers the opportunity to transfer tax credit to ESCOs (Energy Service Companies), banks or companies, allowing households to reduce direct expenditure.[48]
2. **Bonus Casa (House Bonus)**
   Tax deduction (IRPEF) of 50% on the purchase of photovoltaic systems that can be accessed both by the owner and the tenants.[49]
3. **Superbonus 110%**
   Incentive that allows beneficiaries to carry out interventions for the improvement of energy performance and reduction of seismic risk without having any kind of cost.[50]

46 https://www.corriere.it/economia/consumi/22_febbraio_18/comunita-energetiche-22-miliardi-pnrr-svilupparle-italia-4eb53de8-8fe4-11ec-990d-642ea57e6940.shtml
47 El Gobierno anuncia 100 millones en ayudas para impulsar las comunidades energéticas | Idae
48 https://www.agenziaentrate.gov.it/portale/it/web/guest/schede/agevolazioni/detrristredil36/schinfodetrristredil36
49 https://bonuscasa2021.enea.it/index.asp
50 https://www.enea.it/it/cittadini/superbonus-sito-enea-detrazioni-fiscali

Sweden

In **Sweden**, there is an (income) tax credit related to the installation cost for private persons, which is equal to an investment subsidy around 10-15% of the total cost.

Latvia

In March and April 2022, the **Latvian** government launched the first financial support programmes for households. The Ministry of Environment and Regional Development opened a €30 million grants scheme for the replacement of fossil fuel heating systems and installation of renewable energy technologies, including solar PV (max grant amount €15,000 or 70% of the cost of the appliance). The source of the funding is the revenue from the auctions of emission allowances. The Ministry of Economics has prepared a similar programme for energy efficiency and household renewable electricity generation (€3.27 million for technical assistance, guarantees or small grants).

Others good practices

In **Italy**, according to Legislative Decree no. 199/2021, as of 13June 2022, all new private buildings or those undergoing renovation will have to cover 60% of their needs with renewable energy sources or 65 % for public buildings.

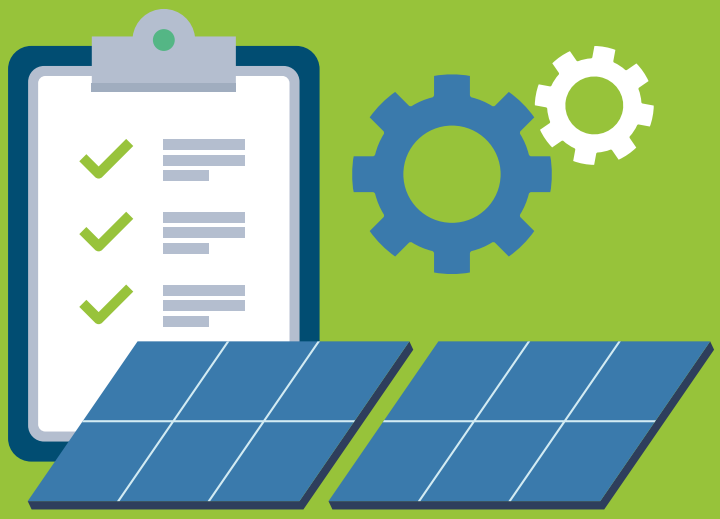
In France, there is an obligation to install solar PV on new or renovated buildings from 500 m2 (compared to 1000 m2 previously).

In Lithuania, there are regulations that require installation of solar PV on renovated apartment houses (with area above 1500 m2) for common use.[51]

In Germany, according to the coalition agreement, it is going to become compulsory at national level to install solar PV on commercial buildings and it will become a common rule for new residential buildings. Some federal states have already introduced such an obligation or are planning to do so. For instance, the state of Baden-Wurttemberg has made it obligatory to include photovoltaic on all newly built buildings. For now, this applies to non-residential buildings. From May 2022, it will also be a requirement for new homes.[52]

51 https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.242058/asr
52 For more information Photovoltaik-Pflicht für alle Neubauten ab 2022: Baden-Württemberg.de (baden-wuerttemberg.de

4. Permitting and administrative procedures



The procedure to install small solar panels should be very simple and straightforward

This chapter includes recommendations, barriers, good and bad practices related to permitting and administrative procedures for rooftop solar PV, including aspects related to grid connection, construction permits and other related administrative procedures (existence or not of a Register for small installations, etc.).

4.1. Policy recommendations

- The legal framework should foresee at least **one consumer friendly modality with access to the grid** that requires as little paperwork as possible, no need to qualify as producer, and non-application of taxes or grid related fees. This modality should **not require administrative permission** to access the grid nor any type of financial guarantee.
- For bigger rooftop PV residential installations, **grid tariffs and network charges** should be reduced as far as possible, applicable only to respect the cost reflective principle. For smaller installations, according to the motivation to support local self-consumption and energy communities established in the RED II, grid tariffs and network charges should be removed.
- **Construction licences or permits should be removed** and substituted by prior notices or a report on the start of activity. Taxes applicable to those licences should be eliminated too.
- The **paperwork time** needed for small installations should be reduced in each country to a maximum of three months in the case of rooftop PV (as long as no authorisation from the Energy Department/Ministry or EIAs are required) from the consumer's first request to the approval of the installation. Response timeframes from DSOs, public authorities and energy suppliers should be gradually reduced. After a learning period, sanctions should be implemented in case of delays. **The process should be digitised.**
- Enhance **one stop shop or single permitting procedures** for administrative and grid connection procedures. A mere declaration or report of start of activity should suffice for rooftop installations, therefore saving time and money for citizens and public administrations.
- Provide informational tools to citizens and community projects in order to navigate permitting and other approval processes.
- A **Registry of small installations** should be operative to keep track of the evolution of rooftop PV. However, public authorities should be in charge and register producers ex officio.

4.2. Rationale

For rooftop solar PV to massively scale up, the **procedure to install small solar panels should be very simple and straightforward** since regular consumers are not used to engaging in business activities. It means that there should be an easy and simplified procedure that does not require burdensome paperwork. For instance, it **should not require qualification as an electricity producer** (which may include registration as sole trader or other legal forms, authorisation from the competent authority, submission of documents, etc.). **It should not demand administrative permission to access the grid nor any type of financial guarantee**, nor complex procedures related to the payment of taxes. Other modalities, which are more demanding from a legal and administrative point of view (with payment of network charges, administrative authorisation, certification as an electricity producer, etc.) should be available for bigger installations, but not for small-scale rooftop solar PV. Network fees and tariffs should be kept only to a minimum to avoid market distortions so that the costs caused by a network user are properly reflected in its distribution tariff.

According to the RED II, no charges or fees shall be applied to self-generated electricity on the premises of the self-consumers. Additional charges, including network charges, shall not be applied to electricity storage since this would entail double charging. To prevent both citizens and public administrations from wasting time

unnecessarily, **the emphasis should be placed on responsible declarations (reporting the start of activities) or prior notices** and not on the granting of permits. Administrative procedures need to be simplified and digitised. The objective should focus on progressively reducing the period of time necessary between the consumer's request and the final approval of the installation, reducing DSOs, energy suppliers and public administrations timeframes to carry out their respective acts and implementing sanctions if needed when those are not respected. It could be done gradually as the different players gain experience. **Public registers** are necessary to keep track of the improvements and evolution of solar PV in the country, but they should not become an excuse to extend the procedures since public authorities themselves can carry out these procedures easily *ex officio*.

4.3. Barriers

4.3.1. The length of administrative procedures

The length of administrative procedures is usually the most common barrier to the uptake of rooftop solar PV. In **Bulgaria**, for instance, the grid connection and construction permitting process may take about six months (when no obstacles occur). In Portugal, they also have issues concerning the amount of time allocated to administrative procedures, which is extremely slow due to the lack of resources on the part of the energy directorate and the high number of involved authorities in the permitting process[53]. In **Spain**, municipalities may require a construction permit and the payment of the construction tax (usually 4% of the investment) which can take 6-8 months to obtain[54]. Luckily, most of the Spanish Autonomous Communities have recently removed such requirements that imply significant delays and hurdles, and only ask for a prior notice or a declaration of the start of activities. However, the permit is still operative in some Autonomous Communities. In Germany, rooftop PV must be registered in the "Marktstammdatenregister" of the Federal Network Agency (BNetzA) as well as with the respective network operator. In general terms, administrative procedures in Germany regarding rooftop solar PV may be considered efficient. However, there are also bad examples, such as the federal tenant electricity promotion scheme "Mieterstrommodell" explained in the next chapter.

4.3.2. The complexity of administrative procedures

Such complexity affects consumers who have limited time and expertise to sort out administrative hurdles and bottlenecks. In **Bulgaria**, for instance, solar installations are promoted mainly by business or citizens with expertise in renewables, while consumers still do not have the confidence to install their own solar PV systems. This is because the regulations, public information and available incentives are not clear enough to encourage consumers to embrace the technology on a large scale. In **Portugal** there is also a need for simplifying administrative procedures, particularly with regard to citizens and/or consumers.

The **Italian** legal framework concerning the installation of PV systems on roofs is complex. The national legislation only provides a general framework, but there are mainly municipal building regulations, different for each municipality. The fact that the legal framework is scattered can represent an obstacle to the development of rooftop PV. Moreover, in Italy, one of the most frequent obstacles is related to the strict protection of particularly valuable assets (historical, cultural, and landscape) that limits the installation of photovoltaic panels on certain buildings and in certain areas (e.g. Historical Centers). Recent improvements were made with Decree-Law no. 17/2022 which states that the installation of photovoltaic and thermal solar systems on buildings is ordinary maintenance intervention and is not subordinate to the acquisition of permits, authorisations or administrative acts of assent, with the exception of systems that are situated on buildings and areas of considerable public interest. In France, procedures should be simplified and made more fluid in order to make it easier for project developers to obtain the various administrative authorisations (town planning, connection, etc.)

4.3.3. Lack of transparency of grid connection procedures

Other barriers are problems related to a lack of transparency and a lack of grid infrastructure to distribute the generated electricity from PV within and between Member States. Grid planning should be reinforced to avoid problems with security of supply due to lack of infrastructure. The promotion of self-consumption schemes with batteries that avoid discharging more electricity to the grid can play a relevant role in the future. In **Greece**, the

53 Eclareon, 2022, p.39
54 Mckenzie Banker, 2020

main reason that impedes solar development, including rooftop solar, is grid availability, which has meant the rejection of many connection requests. In **Bulgaria**, there are frequent negative grid connection statements by DSOs which are often ungrounded, which can be attributed to lack of transparency .

4.4. Practices

4.4.1. Bad practices

Bulgaria

In **Bulgaria**, there is no centralised register for small installations. That prevents accounting for such installations in the national clean energy/energy efficiency statistics.

Greece

In many areas in **Greece**, applications for rooftop solar PV are being rejected due to lack of electricity grid capacity. For PV, this period could be two years in case of connection to the grid operated by HEDNO (as of 2019) and nine months in case of connection to the grid operated by IPTO

Italy

In **Italy**, the 53kW photovoltaic plant designed for the "Comunità Energetica Rinnovabile e Solidale di Napoli Est" (Renewable and Solidarity Energy Community of East Naples) and built on the roof of the "Famiglia di Maria" foundation, without being visible from outside, has been blocked for months due to slow bureaucracy and intricate and contradictory authorisation procedures. The Municipality of Naples, in fact, decided to block the installation claiming that it violated the landscape constraints of the place where it was built and leaving the issue to the Superintendence of Cultural Heritage which, in turn, involved the Campania Region. The latter, referring to the Decree of the President of the Republic no.31 of 2017, which allows the installation without permits of photovoltaic systems not visible from the outside on buildings subject to landscape constraints, unblocked the process. Following a seven month delay, the plant is now regularly in operation, demonstrating how the absence of a clear strategic and legislative process today hinders the development of renewable energy in Italy.

Spain

In **Spain**, there has been a massive delay in the billing system for prosumers due to the need to adapt IT systems particularly in DSOs to the new legal regime. This has affected consumer rights creating a huge amount of reclamations and delays in energy compensation.

4.4.2. Good practices

Spain

In **Spain** there is a modality of self-consumption connected to the grid where a net billing is made between the surplus energy generated and the deficit consumed from the network. The installed power must be less than 100 kW. No local tariffs for energy sharing or financial guarantees to access the grid are foreseen. The public administration registers ex officio installations of 100 Kw or less in the Administrative Register for Self-Consumption.

55 Eclareon, 2022, p.57
56 Eclareon, 2022, p.49

Italy

In the Municipality of Bagno a Ripoli (FI), with the City Council Resolution in force since 4/10/2014, has removed the limitation for the construction of solar thermal and/or photovoltaic systems on the roofs of buildings of particular value and historical and landscape value

Portugal

In Portugal, there are no fees up to 30 kWp under the modality of self-consumption PV (installed on ground or rooftop); there is a registration fee and the need for an operating certificate above 30 kWp. Above 1 MW an evaluation of the project is required. Only installations bigger than 100 kW will need approval from the grid operator (which may be a lengthy administrative process)

Lithuania

In **Lithuania**, a clear and concise procedure for grid connection has been developed that takes only about 30 days (not including solar PV building):

1. Apply to network company
2. Apply to become prosumer
3. Sign contract with the network company on technical conditions.
4. Select certification company
5. Make a declaration to the network about connected solar PV and smart meter

Latvia

In **Latvia**, from 2020, systems below 11.1 kW no longer need a permit from the Ministry of Economics, and net-metering systems are now exempt from the variable part of the mandatory procurement component (MPC) fee for electricity fed into the grid and taken back.[57]

57 For more information, see PV policy developments in the Baltic states – pv magazine International (pv-magazine.com)

5. Energy sharing and collective self consumption

Putting citizens together and sharing energy implies using economies of scale and is more efficient than single self consumer schemes

The policy recommendations in this chapter are designed to enable energy sharing and collective self-consumption to be understood as a specific activity.

The next chapter focuses on recommendations to improve the organisational and market aspects of energy communities, keeping in mind that self-consumption and energy sharing may occur within an energy community. The RED II defines jointly acting renewables self-consumers as a group of at least two cooperating "renewables self-consumers [...] who are located in the same building or multi-apartment block" or, where permitted by a member state, within other premises. From here on, we will use the term **collective self-consumption (CSC)** to refer to "jointly acting renewables self-consumers". The term **"energy sharing"** is not further defined in the RED II. We will define energy sharing as a kind of "virtual collective self-consumption through the distribution grid", i.e. across several buildings or from renewable plants to buildings, but still in a local or regional context. However, it should be noted that e.g. Spain and France also call this activity - which goes beyond one building - CSC, so they interpret the RED II provision in a wider sense.

5.1. Policy recommendations

- All **national frameworks should allow for both energy sharing** (through the distribution grid) and **collective self-consumption** transposing and implementing the RED II.
- **Proximity and size requirements should not be restrictive**, i.e. several kilometres of distance and up to plant sizes in the MW range.
- Energy sharing and collective self-consumption in **apartment buildings** or similar structures should be feasible **without the need to constitute an energy community**. In these cases, **majority rules** to agree on installing solar PV on rooftop should be easy to achieve, avoiding conflicts among members as far as possible.
- **Restrictions for stakeholders to participate** in the energy sharing scheme or in the CSC concept should be limited as far as possible, for instance allowing members to be outside of the proximity requirements. **Virtual energy sharing schemes** offer a great opportunity for citizens without access to suitable rooftops to participate and to enable and mobilise funding.
- Allowing **vulnerable households** to participate with more favorable conditions is another way to flexibilize energy sharing while helping to address the energy poverty issue.
- **Flexible options** should be allowed to increase the chances of energy sharing or collective self consumption while encouraging (or at least not limiting) multiple **potential business models**. Either the collective or a third party should be able to own and operate the installation.
- The rules regarding the **distribution of energy should be flexible enough** so that the members of the collective can agree on whatever option they believe is better, including, if applicable, dynamic and variable coefficient distribution options, thus enhancing their capacity to manage their demand.
- Bureaucratic procedures should be simplified.

5.2. Rationale

Energy sharing and collective self-consumption (CSC) can unleash the potential for a massive scale up of solar PV widely across Europe. Putting citizens together and sharing energy implies **using economies of scale** and is more efficient than single self-consumer schemes or similar. **It maximises the value of the electricity for the consumers, it reduces grid congestion and losses, and makes solar PV cheaper**. It enables citizens to install larger plants and make full use of roofs, since buying PV panels in bulk lowers the per unit cost and there is no need to buy additional meters and inverters. Moreover, since the cost can be divided among several participants on the basis of their participation, those having less capital can invest in lower percentages and still benefit from solar PV.

However, **many countries have not yet established legal frameworks allowing for energy sharing** and/or collective self-consumption, while the ones that have, are still in an early stage of implementation, so we should expect significant changes in the following years enabled by the transposition and implementation of the RED II. In Article 21 the Directive states that **all final consumers have a right to participate in joint renewables self-consumption**, which must be allowed for multi-unit buildings and multi-apartment blocks. This reference is important, **since over 40% of Europeans live in apartment blocks**[58], so consumers who live in multi-tenant buildings, or who live in a building with a roof not suitable for PV, can still be active and obtain the benefits of a decentralised energy transition[59].

In conclusion, limits to energy sharing and CSC in legal frameworks should be minimised to the extent possible, **making proximity requirements, size restrictions or entry requirements more flexible for stakeholders to participate** in the collective in order to enable them to reap the benefits of energy sharing and CSC. From this perspective, both larger areas and allowing different voltage levels enable more participants to get involved in the energy sharing scheme. **Increasing flexibility** for establishing different types of collective schemes is always an ally for solar PV development, for instance accepting members that come from outside the proximity requirements or allowing for third parties to own and operate the installation. Both measures could facilitate investment, new business models and the needed social acceptance among the citizens. Prosumers should not be limited to a single way of prosuming, but to be able to choose among as many options as possible, including, if applicable, dynamic coefficients of energy distribution, so adapting the real consumption of each participant in the collective.

5.3. Barriers

5.3.1. Lack of regulation framework for energy sharing

Most EU countries started adapting their national regulations towards the implementation of energy sharing and/or CSC in 2020 mostly referring to multi-apartment houses (Frieden et al, 2020, p.11). From the selected countries in this report, **Spain, France, Italy** and **Portugal** allow the use of the public grid for CSC or energy sharing. **Greece** and **Lithuania** allow for virtual or remote net metering schemes. Some other countries, like **Germany, Bulgaria, Sweden** and **Romania**, have introduced local self-consumption approaches without energy sharing. In Germany, the so called “Mieterstrommodell” was introduced in 2017, which enables the plant operator in multi-apartment buildings to sell electricity to the tenants in direct proximity. This electricity must be supplied to and consumed by final consumers within the building or in residential buildings or ancillary facilities in a direct spatial relationship with this building, and it must not pass through the public electricity grid. However, this scheme has not been a success due to numerous complications, so there may be changes to the regulation during 2022 (see box below). Even though energy sharing is not possible yet, it might change with new upcoming regulations according to the New Coalition Agreement.

Similarly, in **Sweden**, collective self-consumption is allowed via a separate direct current grid between buildings with the same building owner, not through the public grid. Finally, in Latvia, housing associations may use solar PV for their collective consumption on common premises but the option to distribute electricity to individual apartments is not yet available since solar PV installations can only be connected to a single smart meter. This means electricity cannot be shared among the residents as individual clients.

5.3.2. Proximity requirements

Most Member States limit CSC to multi apartment buildings using direct lines. However, **France, Spain** and **Portugal** foresee collective energy sharing via the public grid, and they establish geographical limitations. Portugal has not set a concrete geographical boundary, but the terms of neighbourhood relationship and proximity of the project have to be respected and assessed individually in each case. The assessment will vary depending on where the project’s transformation stations are located, technical and regulatory elements and voltage levels. For instance, for low voltage, it is up to 2 km. With a different approach, **France** uses a spatial limitation of 2 km for its CSC scheme, with exceptions up to 20 km in rural areas with low population density

58 https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210521-1
59 Energycities, Friends of the Earth Europe, Greenpeace EU, REScoop.eu, 2018.

and under specific circumstances. In **Spain**, collective self-consumers have to fulfil at least one of the following criteria:

- be located within the low voltage distribution grid derived from the same transformer station
- respect a maximum distance of 500 meters between production and consumption points
- be located in the same cadastral area[60].

The limit of 500 meters has generated a lot of criticism in Spain, particularly with regard to rural areas and when it comes to using roofs from industrial areas, since it clearly reduces the options for energy sharing and CSC.

5.3.3. Size restrictions

Larger installations will provide more electricity for the same number of consumers and will also offer higher levels of self- consumption or sharing through the grid, which will result in greater economic benefits for the members and consequently more CO2 reductions since the incentives to participate will be higher. So, enabling the participation of larger installations on collective schemes and being more permissive about size restrictions should enhance energy sharing and CSC. For instance, **Spain** and **Germany** limit the possibility to participate in collective schemes when requiring a maximum of 100 kW to qualify for the Spanish self-consumption modality or to access subsidies and remuneration schemes in Germany respectively. **Portugal** requires that members of the collective operate under the same voltage level, while procedures vary according to size (there is a registration fee and the need for an operating certificate above 30 kWp while an evaluation of the project is required above 1 MW). Despite this, there is no absolute size limitation. In practical terms, developing projects over 30 kWp is much more complicated because of the administrative burdens, a lack of clarity, etc. Meanwhile, France and Greece have set quite permissive limits at 3MW;

5.3.4. Reaching an agreement with neighbours in a building or other facilities

The option to install solar PV in multi apartment buildings should not depend on the creation of an energy community. In **Lithuania** and **Greece**, the constitution of a civil cooperative for that purpose is a requirement. This constitutes a clear barrier to the development of solar PV in multi apartment buildings, where conflicts among neighbours may easily arise. In this case, the use of existing models for collective decision making (e.g. housing associations) might be good as a basis, even if they don't equate to an energy community. Majorities needed to reach agreements among neighbours should be easy to achieve as well. In Spain, there was a recent modification of the Horizontal Property Law that simplified the required majority to install rooftop solar PV. Now it is enough to carry on with the installation if the number of "yes" votes outweighs the number of "nos" only taking owners present at the meeting into account.

5.3.5. Limited options of business models

The goal of energy sharing and CSC schemes should be to incorporate as many stakeholders as possible. By definition, potential stakeholders in a renewable energy community are limited to legal geographic boundaries, however, innovative options to incorporate members outside of the proximity requirements can create new business models and help boost the development of PV. In **Greece**, collective self-consumption and energy sharing can be implemented by virtual net metering, which can only be used by public and private entities and professional farmers as single persons/entities. The rest of the stakeholders should constitute an Energy Community (civil cooperative) in order to use the virtual net metering scheme. In these cases, on the mainland, the production and the benefits to be offset must belong to the same region in which the energy community is located[61]. Even though the scheme is attractive, consumers have shown little interest in becoming involved in distributed generation, mostly because they find it difficult to cover the costs for such an investment[62]. The cooperative Som Energia created Generation kWh in 2015. It is a financing scheme in reaction to the subsidy cuts for renewables in Spain, which provided its members with a zero-interest loan and electricity at the cost of generation compensated annually on their electricity bill. In practical terms, it could be associated with a virtual net metering scheme, since participants finance solar PV and they get a return in terms of electricity bill compensation even though they have not installed their own solar PV. Although there is no specific legal framework for virtual net metering, organisations may find ways to innovate and obtain similar results[63].

60 Tuerk and Frieden, 2020
61 For energy communities in the region of Attica, the production station is allowed to be installed in a neighbouring region. The non-interconnected islands should be on the same electrical system.
62 Iliapoulos et al, 2020, p.251
63 Generation kWh | Autoproducción Compartida de Energía

Meanwhile, giving a third party the option to own and operate the plant increases the variety of potential business models and improves access to financing. **Greece**, for instance, requires the collective to own and manage the installation, while in **Germany** the owner has to be registered as an electricity supplier, a very long and burdensome procedure. These requirements significantly reduce the type of parties/citizens who might be interested in participating. France, Spain and Portugal present more flexible options and allow for either the collective or a third party to own and operate the installation. In **Portugal**, contracting and other forms of external ownership are covered by the legislation, which foresee the option of involving external investors[64].

5.3.6. Static distribution of electricity

Plenty of options should be available for prosumers connected to the grid to distribute electricity as they choose. For energy sharing and CSC to work, as long as the members agree on it, it is essential that the distribution of energy is adapted to the real consumption of its members while promoting their capacity to manage their demand. This is achieved by ensuring that this distribution is made once the consumption has been recorded and not before. In **Spain**, the collective can distribute the production according to their best interests. However, coefficients are not dynamic, since they have to remain constant during the billing period for each consumer (the members can modify the agreement making use of addendums). In **Portugal**, dynamic tariffs are regulated but not yet implemented. In **Germany**, the tenants have to share the electricity produced by the installation according to their consumption in 15 minute intervals, with other options of distribution excluded[65].

5.4. Practices

5.4.1. Bad practices

Portugal

In **Portugal**, the energy shared between apartments pays network access tariff, which is a clear barrier for CSC while also penalising small units.

Germany

German landlord-to-tenant electricity program

Landlord-to-tenant electricity is a programme funded via the "landlord-to-tenant electricity premium". The installation operator can demand the premium from the grid operator if the eligibility requirements are met. It enables the operator to sell locally produced electricity to the tenants in a multi apartment building in direct proximity. The participants do not constitute a collective or legal entity, they don't have any relationship with each other. The landlord or electricity supplier representing the installation has a contract with each tenant, separate from the tenant's lease, who agrees a rate, which is no more than 90% of the retail electricity price. It is available for solar installations with a total installed capacity of up to 100 kilowatts located on or in a residential building. The plant operator must have the status of an electricity supplier. The procedure to become an electricity supplier is a long and burdensome one.

The federal tenant electricity promotion scheme has been in place since 2017, but only about 1% of the annual budget has been claimed. The main barrier to the programme's success has been a complex set of legal requirements that cover the duties of a tenant electricity supplier, customer base, size of PV systems, electricity measuring and billing, taxes and levies, and support schemes.[66]

64 Frieden et al, 2021
65 Mackenzie Banker, 2020
66 Moser et al, 2021. For more information: BMWK - Frequently asked questions about landlord-to-tenant electricity (bmwi.de)

5.4.2. Good practices

France

In **France**, the collective can decide how to distribute electricity and dynamic coefficients are available. Electricity can be distributed on the basis of a combination of agreed percentages, for instance, proportional to the amount each member invested, and according to their own demand/consumption. If a participant owns 40% of the installation but consumes only 20% of electricity generated, and another participant owns 40% but consumes 60%, the first consumer can "sell" that electricity to the second consumer. A software platform can help track the amounts "sold" and can also facilitate the financial transaction between the parties. This will increase the efficiency of the system while still offering flexibility to the consumers[67].

Lithuania

In **Lithuania**, "Ignitis gamyba" AB – Lithuania's largest electricity generation company - initiated the remote solar park platform Ignitis Saulės Parkai (Ignitis Solar Parks) in April 2020. It is a solar platform offering residents the chance to acquire part of solar power plants and become active remote prosumers. About 20 MW were offered but there are currently not enough solar parks to satisfy demand. It enables customers who do not have their own roof space or whose roof unsuitable to buy or rent part of a solar park

67 Mckenzie Banker, 2020, p.71

6. Energy communities

Opening new types of initiatives that empower smaller actors toward a more decentralized system of energy production and consumption

In this chapter we include recommendations, barriers, good and bad practices related to the national frameworks of energy communities, including both renewable energy communities (RECs) and citizen energy communities (CECs).

In fact, it is expected that the development of both RECs and CECs may substantially increase solar PV development, creating social acceptance and support, allowing for new business models and enabling easier access to financing. Now it is the Member States' role (due in June 2021) of Member States to translate this big picture into concrete provisions that make the roll out REC and CEC a reality. The deadline for the transposition of the EU provisions on energy communities has already passed, though several Member States, especially in Eastern Europe are lagging behind.

6.1. Policy recommendations

- An **assessment of the barriers and potential** for renewable energy communities should be undertaken by all Member States, in line with the requirement of article 22(3) of the RED II.
- All Member States should **transpose RED II and the Electricity Market Directive (EMD)** developing the definitions of renewable energy communities and citizen energy communities
- The **criteria of the EU definitions should be reflected** and developed clearly in detail in national legislation (openness and voluntary participation, autonomy, effective control, geographical proximity). In this regard, national legislation should make clear which **legal forms** respect those criteria and under which conditions.
- National legislation should **cover both definitions** (REC and CEC) and make them coherent
- Both **ambitious and adequate objectives** should be set for the development of rooftop solar PV projects by energy communities
- An **authority should be designed to follow up** and monitor the implementation of the formulated objectives and provisions for energy communities
- Ensuring a **non-discriminatory treatment and a level playing field for CECs and setting up an enabling framework for RECs,** as defined in article 22(4) of the RED II, requires the definition of ambitious measures that **facilitate access to financing, technical expertise and capacity building** since both RECs and CECs start from a very different standpoint to commercial companies.
- Objectives for RECs and CECs should be clearly defined in national legislation, with a **clear allocation** of responsibilities and governance criteria, which prevents other companies from using them as "greenwashing".
- Policies and measures should be put in place to support incorporation of **vulnerable households** into the design of both RECs and CECs-.
- The necessary conditions for a fruitful **partnership between REC, CEC and public local entities** should be created.
- **Include energy communities in national energy planning**. NECPs should include provisions for the minimum capacity of RES projects from energy communities.

6.2. Rationale

RECs (defined in the RED II) and CECs (defined in the EMD) enable the collective organisation and participation of citizens in the energy system, opening new types of initiatives that **empower smaller players in a more decentralised system** of energy production and consumption (prosumption). Their commonalities are that they require a legal entity as a community umbrella, should be voluntary and open, focus on environmental, economic and social benefits instead of financial profits and require a specific governance (essentially, the participation and effective control should be in hand of citizens, SMEs and public authorities)[68].

68 Frieden et al, 2020, p.6

RECs have stricter requirements related to proximity, autonomy, and effective control criteria and the expansion of renewables as their main purpose (other type of energy sources are excluded), while CECs have no geographical limitation, can be applied to any type of technology (also non renewables), deal with electricity only and their main purpose is to **create a level playing field for the CECs as a new market actor** in the electricity market exclusively.[69] RECs and CECs can focus on many activities (production, distribution, consumption, supply, aggregation, flexibility, energy sharing, storage, electric vehicle charging services, etc.). Rooftop solar PV is **therefore a type of activity that both REC and CEC can develop since it fulfils the requirements of both organisations**.

The key elements of a legal framework conducive to the take-off of energy communities is the following:

- **Assessment of barriers and potentials for RECs:** The RED II establishes the obligation that the Member States carry out a complete evaluation of the barriers and potential for renewable energy communities at national level
- **Clear definitions:** the definitions should ensure that the legal criteria associated with energy communities are focused on generating social, economic and environmental benefits in the wider sense and not only on making economic profit. The support regime for renewable energy communities is justified for their goal, which goes beyond making economic profit. The definition should differentiate between REC and CEC and make those definitions coherent and compatible.
- **Objectives, trajectories and follow up:** Without the establishment of objectives for the development of energy communities, a realistic evaluation of the success or failure of the enabling framework will not be feasible. Furthermore, an authority with expertise should be designed to oversee the development of energy communities and the follow up.
- **Ensure non-discrimination:** REC and CEC start from very specific barriers compared to other more consolidated commercial companies (in aspects such as technical training or financing) and have the advantage of social, economic and environmental benefits recognised by the Directive. With this justification, they demand ambitious measures of support so that they can compete under equal conditions with other companies and grow. This must be translated into very specific support actions with regard to access to the grid, financial access, simplification of administrative procedures, etc.
- **Establish responsibilities and governance criteria:** Ambitious support measures must be accompanied by the establishment of responsibilities, so that it is ensured that energy communities comply with the principles established in the European directives (open and voluntary participation, eligibility to be a member of the energy community, effective control and autonomy), to prevent them from being used by companies whose exclusive purpose is making financial profit.
- **Partnership with public local entities:** Public authorities and local citizen initiatives are natural allies in carrying out local renewable energy projects. An Energy Cities report from May 2019 underlines a "natural" relationship between local public authorities and energy cooperatives.[70] However, usually neither the local authorities nor the communities have the capacities, resources, etc. to undertake joint projects. In addition, local public authorities face a series of challenges (legal among others) to participate directly as one additional partner in the generation of renewable energy projects. Therefore, work should be done to establish the appropriate legislative framework that offers security to local entities when actively participating in local energy communities, respecting the principles of transparency and non-discrimination established in the public procurement legislation.
- **Support for vulnerable, energy poor and low income households:** Public administrations must promote policies and measures that make it easier for energy communities to incorporate economically vulnerable, energy poor and low income households. For instance, establishing aids so that economically vulnerable households can participate in energy communities. Municipalities could proactively offer vulnerable households the opportunity to participate at no upfront costs in municipal projects (for example, photovoltaic installations in schools). These households should also receive free energy advice.

69 Ibid
70 Bolle, 2019

6.3. Barriers

6.3.1. Absence of transposition and enabling frameworks in many countries

The transposition process has not yet been finalised. For instance, in Bulgaria there is no legislation specifically targeting energy communities. In **Latvia**, the transposition process is in progress and the definitions will be included by amendments to the Law on Energy and the Electricity Market Law according to the Draft Amendments to the Law on Energy[71] and the Draft Amendments to the Electricity Market Law[72] respectively. However, they have not been approved yet[73]. In **Germany**, currently energy communities "follow the rules that apply for cooperatives in general under the Cooperatives Act and the rules that apply to all market actors for the development of renewable energy projects under the German Renewable Act"[74]. Germany has defined CECs. **Sweden** has not yet proposed legislation transposing energy communities, but the national regulator has made recommendations on how to transpose the law.

Other EU countries have dealt with the transposition process in a superficial way, copy-pasting the EU definitions without clarifying the key concepts, such as is the case in Spain, Romania and Portugal. Without proper definitions, there is no basis for developing any measures for energy communities, because no one knows what an energy community is and what it is not. In **Spain**, in RDL 23/2020, the national legislator has introduced REC for the first time with the same wording given by the RED II but no explicit reference is made to CECs. In November 2021, the Spanish Government opened a consultation process[75] regarding the transposition of the Directive on local energy communities. However, no draft has been published up to now. In **Romania**, transposition legislation for the Electricity Directive simply copies and pastes the wording of the directive itself[76]. In **Portugal**, the Renewable Energy Communities definition copies the RED Directive concept and was introduced in the Law on renewables collective self-consumption[77]. A Citizens Energy Community definition was later incorporated in the Law organising the electricity system[78] in early 2022. In practice, its implementation is not sufficient for regulatory and procedural reasons. Although the first legislation dates from 2019, the first renewable energy communities are just starting now.

Finally, other countries such as **Greece, Italy, Lithuania** and **France** have gone much further in the transposition process, providing details for major technical and governance-related elements such as geographical limits, effective control or grid tariffs. **France** published an Ordinance in March, 2021, with provisions on both renewable energy communities and citizen energy communities[79]. **Greece** was a frontrunner that established a new type of civil cooperative, the "energy community" (Law 4513/2018), including most of the criteria foreseen in the EU definitions (effective control, open and voluntary participation, local proximity, etc.), before the adoption of the EU definitions. Since 2020, energy communities are active in **Italy**, first in experimental form with the "Milleproroghe 2020" Decree and from November 2021 in full form with the transposition of the European RED II Directive through the Legislative Decree no. 199/2021, from which the executive decrees are still pending. Lithuania transposed the legislation on RECs defining them as non-profit-making legal entities who own and develop renewable energy production facilities and have the right to produce, consume, store and/or sell energy[80]. No RECs nor CECs have been constituted there.

Finally, despite adopting definitions, hardly any Member States have put complete enabling frameworks in place.

6.3.2. Lack of clarification of the legal form

Different approaches have been adopted with regard to the legal form. An open approach accepting any type of legal form may be beneficial to facilitate innovation and the proliferation of multiple business models. On the other hand, requiring a specific legal form may enhance implementation as it avoids dealing with time consuming complexities related to choice. With regard to the purpose, some legal forms are non-profit oriented

71 http://tap.mk.gov.lv/mk/tap/?pid=40500367
72 https://www.google.com/url?q=http://tap.mk.gov.lv/lv/mk/tap/?pid%3D40502441&sa=D&source=docs&ust=1651747610531680&usg=AOvVaw1F4xMoJEnIfZW6HGt_Bjq2
73 Latvia - REC/CEC definitions - REScoop, accessed 12/4/2020
74 Germany - REC/CEC definitions - REScoop
75 https://energia.gob.es/en-us/Participacion/Paginas/DetalleParticipacionPublica.aspx?k=358
76 Romania - REC/CEC definitions - REScoop, accessed 12/2/2020
77 https://dre.pt/dre/detalhe/decreto-lei/162-2019-125692189
78 https://dre.pt/dre/detalhe/decreto-lei/15-2022-177634016
79 France - REC/CEC definitions - REScoop, accessed 12/4/2022
80 Lithuania - REScoop, accessed 12/4/2022

(associations, etc) and more suitable for ensuring environmental and social purposes, while other legal forms have financial profit as their main goal (commercial companies) and are less likely to promote environmental and social goals.

A general distinction can be made between the use of already existing legal forms under certain criteria or the formulation of a singularly and new specific legal form of energy community. **Greece** and **Sweden** (the latter in its consultation document), for instance, require a specific legal body. The **Swedish regulator** recommends that energy communities adopt the legal form of Economic Associations (the Swedish version of cooperatives), under the Economic Associations Act, which have a one-person-one-vote. This form allows the entry and exit of the partners without excessive obstacles, maintains the ability to promote the financial interests of its partners without profit being its primary purpose, as well as the ability to carry out specific activities in the energy sector on behalf of its partners[81].

In **Portugal** and **Lithuania**, there is no pre-defined legal form to be adopted. One of the risks related to this approach is that legal forms associated with commercial companies have financial profit for their partners as their main goal. This could trigger hijacking, which happens when energy communities are developed by private investors and not citizens, in order to take advantage of the incentives provided for them. In **Italy**, the law establishes that CECs can adopt any legal form, as long as the main purpose is to bring environmental, social and economic benefits to the local community (article 14(6))[82]. In **Spain**, it remains to be seen which approach will be adopted, but a dedicated legal framework already exists for Energy Consumption Cooperatives (Cooperativas de Consumo). An important criterion for the chosen approach may be the recognition of pre-existing initiatives, with the aim to best integrate these in the new frameworks[83].

6.3.3. Not complying with the basic principles and criteria of REC and CEC[84]

The RED II requires members of RECs who exercise control need to be located in proximity to the renewable energy projects, but it does not require t all members to fulfil the proximity requirement. European legislation is less restrictive towards CECs, which do not have proximity requirements but have size limitations. In Portugal, for instance, the CEC definition limits participation to SMEs, excluding big companies. On the contrary, in France there are no restrictions on participation according to the legal definition of CEC. Restrictions could limit potential expansion of energy communities, but on the other hand, overly permissive criteria could create a risk that energy communities become hijacked by traditional energy sector markets. In Italy, the geographical limit chosen for Renewable Energy Communities is the perimeter associated with the primary electricity transformation cabin, which can even reach 30-40 thousand users. However, in this case, the information used to define the perimeter is not in the public domain, so the organisation of a REC could be complex. An alternative would be to propose identifying the users that can be part of the same REC through the use of publicly known Postal Codesas some Italian organisations such as Legambiente have proposed.

Countries like **Greece** or **Lithuania** demand 51% of members to be residents in the municipality of the production plant or a neighbouring municipality (Lithuania). Or that 50% plus one of the energy community members have local ties with the district of the energy community's headquarters (Greece).[84] This approach gives more room for expansion of RECs than requiring all members to be local. Both countries have defined very specific membership criteria. In **Greece**, between two and fifteen participants are required for the establishment of an energy community depending on the circumstances, while in **Lithuania** at least three members of the REC should be natural persons with the right to vote at the general meeting, holding a minimum of 51% of all votes[86]. Specific national corporate law may add specific governance aspects. In **Portugal**, for instance, a minimum number of four members is required in a cooperative, while only two members are required in the Spanish cooperative legislation.[87]

81 Sweden - REC/CEC definitions - REScoop, accessed 12/4/2020
82 Italy - REC/CEC definitions - REScoop, accessed 12/4/2022
83 Frieden et al, 2021
84 Open and voluntary participation, effective control, proximity criteria and democratic governance.
85 Frieden et al, 2021
86 Ibid
87 Ibid.

6.3.4. No clear differentiation between CECs and RECs

In **France**, they are two different concepts for CEC and REC, being eligibility the most differentiated aspect between them, so that there are no restrictions to participate in CECs while strong restrictions are imposed on companies to participate on RECs. The legislation lacks provisions on how CEC and REC should relate to each other[88].

In **Greece**, there is no difference between REC and CECs, but legislation separates non-profit and for-profit energy communities. Greece's experience has shown that a broad definition caused "hijacking" and many energy communities were created by private investors and not citizens. They took advantage of the incentives provided for them[89], bypassing steps in environmental permitting, avoiding the competition with their peers and securing generous feed-in-tariffs. Since 2018, many legislative changes have happened in an effort to address the above-mentioned problems, thus creating an unstable environment for the development of energy communities.

In **Sweden**, the regulator has proposed an overarching concept, the energy community, with two operative definitions: citizen energy communities and renewable energy communities. This should help to promote a coherent approach[90]. SImilarly, the poposed Latvian approach (in a proposal stage too) is to state, at first, the general definition of energy communities and then provide the definitions of RECs and electricity communities.[91]

In **Italy**, energy communities are divided into two types:
- The collective self-consumption, with a perimeter defined by the building itself in which they can develop.
- The Renewable Energy Community with perimeter defined by the primary electricity conversion cabin from high to medium voltage that can even reach up to 30-40 thousand users.

6.3.5. Absence of a supervising authority

The designation of an authority to supervise the implementation of the legislation regarding energy communities is key in terms of adopting a governance approach consistent with monitoring and compliance. However, **France, Greece** and **Portugal** have not designated any authority, which could lead to mistrust and imply risks of abuse of the REC and CEC concepts. In **Lithuania**, the State Energy Regulatory Board will inspect, supervise and control the compliance of RECs. In **Sweden**, a supervising authority and a registered are proposed; while in **Latvia**, similarly, the draft proposal establishes that the State Construction Control Bureau will run a register of energy communities, ensure its public availability and perform supervision of energy communities. I**taly** adopts the most detailed approach indicating the authority (ARERA) in charge of defining the technical rules to calculate the "shared energy" and ensuring that RECs are not subject to obstacles and unjustified discriminations; and establishing that the Energy System Manager (GSE) is responsible for the registry of RECs registry and monitoring their evaluation.

6.3.6. Lack of provisions for vulnerable, energy poor and low income households

To date, Greece has established the most concrete approach to incorporate vulnerable, energy poor and low income households. It offers vulnerable consumers or citizens living under the poverty limit who live in the same district where the energy community is located a right to be involved in virtual net metering, as long as energy communities wish to include them. This constitutes an exception to the exclusive access to members of the energy community. These types of provisions are especially important in the current situation where the electricity price on European wholesale markets is escalating and reaching historical maximum values across the continent mainly due to the rise of the natural gas and CO2 emissions prices.

In **Italy**, the transposition promotes inclusiveness in REC approaches by stating the need to open them to vulnerable and low income households. **Bulgaria** has announced the will to address these issues in forthcoming legislation on energy communities, while in **Portugal** the national long-term strategy to fight energy poverty suggests energy communities could be a way to tackle energy poverty, even though the approach lacks concrete measures.[92]

88 France - REC/CEC definitions - REScoop, accessed 12/4/2020
89 Greece - REC/CEC definitions - REScoop, accessed 12/4/2020
90 Sweden - REC/CEC definitions - REScoop, accessed 12/4/2020
91 Latvia - REC/CEC definitions - REScoop, accessed 12/4/2020
92 Frieden et al, 2020

6.4. Practices

6.4.1. Bad practices

Common bad practice

Many Member States have not transposed the EMD and the RED II with regard to REC and CEC, which were due in December 2020 and June 2021 respectively. Even though some Member States have adopted definitions, most are very superficial and provide very little detail (if any) on the actual principles. Essentially most Member States have copy-pasted the definitions of the directives. Despite adopting definitions, almost no Member States have put in place enabling frameworks for these communities to emerge as requested in the directives. Some good examples would be France, Austria, Italy and Ireland.

6.4.2. Good practices

Italy

PNRR funds for energy communities in small municipalities

In Italy, the PNRR (National Recovery and Resilience Plan) has allocated €)2.2 billion to support the creation of energy communities in small Italian municipalities, i.e., those with a population of less than 5,000 residents.

93 https://www.corriere.it/economia/consumi/22_febbraio_18/comunita-energetiche-22-miliardi-pnrr-svilupparle-italia-4eb53de8-8fe4-11ec-990d-642ea57e6940.shtml

7. Additional measures to support solar PV development

To compensate for public perceptions and clearly visualize the multiple benefits of solar PV, public awareness campaigns are needed.

In this chapter, we include a set of policy recommendations, barriers, good and bad practices that don't fit in the previous chapters, but that are necessary to complement them.

7.1. Policy recommendations

- Launch **awareness campaigns** for the wider public that disseminate the benefits of solar rooftop PV and ensure easy access to information
- Develop renewable energies **training programmes** for administrative staff as well as national, regional and local policy makers
- Support programs to ensure sufficient and well **qualified installers**, energy planners and architects
- Roll-out **digital meters** with access to data for energy users to facilitate efficient (collective) self-consumption schemes and grid integration, while ensuring data privacy protection.
- Timely preparation of the distribution grid level in view of a massive roll-out of solar PV and self-consumption, in the context of mobilising all flexibility options.

7.2. Rationale

Myths and false public perceptions that indicate that solar PV is not yet a consolidated and reliable technology still exist across the EU. This could be due to a hesitant or negative attitude towards renewables in the media or in society in general. Also the expansion phase of renewables in the 2000s was interpreted by some groups in some countries as a **boom and bust situation that led to corrupt attitudes** oriented exclusively towards profit making[94]. To compensate for such public perceptions and clearly **visualize the multiple benefits of solar PV, public awareness campaigns are needed**.

Training activities oriented to administrative staff and policy makers of all governmental levels enabling them to solve in an agile way current bottlenecks and hurdles, are also needed due to lack of staff specialised on energy issues capable of dealing with very complex topics such as permitting. This is due to the **inherent complexities of the energy sector and the increasing importance of the renewables sector** (recent abrupt variations in the price of electricity, effects of climate change, availability of energy resources, etc.) which have created a **gap of well-prepared professionals**. There is also a **need for qualified installers, energy planners and architects** with specific knowledge on solar PV particularly in those countries where the demand is increasing fast.

Finally, the provisions of EU legislation regarding **smart meters** should be fully deployed in all national countries offering guarantees for the **protection of privacy data** so that consumer rights are fully implemented. It will make self-consumption and energy sharing a feasible option. Smart meters may help consumers to better understand the link between their habitual use of energy and their energy consumption and spending attitudes. Smart meters may **increase grid operators' options to better manage the network** and plan the investments due to improvement in observability and control while reducing operating and maintenance costs. On the other hand, precisely because of this increase in the control and observability capacities of grid operators, there has to be a stricter observance of protection of privacy data offering guarantees to consumers.

7.3. Barriers

7.3.1. Lack of knowledge and misconceptions

There is still a large part of the population that does not trust solar PV as a reliable technology. There are myths and misconceptions that have harmed the sector which are very significant psychological barrier when investing in solar PV. Some public perceptions even mistakenly attribute recent energy price hikes to renewable sources or the energy transition, such as is the case in **Bulgaria**. There are some narratives that interpret the benefits

94 Eclaeron, 2022, p. 67

provided by government policies in the past (basically feed-in-tariffs) in countries like **Spain, Latvia** or **Bulgaria** as an unfair gain by renewables promoters and developers[95].

In Spain, according to surveys elaborated by IDAE, the main obstacles and barriers to the deployment of solar technology are a lack of knowledge or awareness among citizens. Some people still believe that the former solar tax on distributed generation is still operative and there is lack of reliability in general on solar PV technology (for instance, they believe that the technology is too new and it could break electric installations). In general, a lack of awareness is a common barrier in most of the European countries, also noticed in countries like **Germany** or **Sweden**, which have gone further in solar PV uptake.

7.3.2. Lack of staff and expertise on renewables

This is a barrier that affects both the public sector and RES installers and technicians, significantly reducing the speed at which solar PV penetrates the market. This lack of a technical workforce working on the ground to meet the increasing demand requires more training and specialised courses. It affects most of the EU countries due to complexity being an inherent factor of the electricity sector and the sharp increase in the demand of solar PV, but it has been highlighted to be relevant in **Germany, France, Sweden** and **Spain**, all countries with a very high demand for solar PV in recent years. There is therefore a need to finance and establish training programmes at all levels, modifying regulations related to certified diplomas, adapting existing curricula and vocational training programmes so that a sufficient number of installers and technicians may face the challenge of responding to the current and future demand for solar PV.

7.3.3. Slow deployment of smart meters

Smart meters are designed to provide consumers with information on a real-time basis about their domestic energy consumption, in order to give them greater clarity on their consumption behaviour. It is also a precondition for collective self-consumption and energy sharing, in order to keep accountability of the exchanges produced, and helps electricity suppliers with system monitoring and customer billing. **Member States are required to ensure the implementation of smart metering under EU energy market legislation subject to a long-term cost-benefit analysis (CBA). In cases where the CBA is positive, there was a roll-out target of 80% market penetration for electricity by 2020.**

According to a report[96], **half of the electricity meters in Europe are now smart**. In 2020, approximately 150 million smart electricity meters were installed. However, the installed base is expected to increase by 7.2% per annum throughout 2026[97]. The majority of countries in Western and Northern Europe have either completed or are at an advanced stage in smart meter rollout. **Spain** and **Sweden** have reached almost 100% installations following a government mandate. Italy is in a very advanced position as well.

Despite the many deployment success stories, some EU countries were still behind the target in 2021. **Portugal** was a late starter to the rollout, with installations beginning in 2019. By 2025, the country will have reached full coverage with 2.5 million smart meters installed. Bulgaria has not yet completed its Cost Benefit Analysis on the rollout of smart meters[98]. **Lithuania** had a smart meter penetration of only 2.8% in 2020[99]. It had previously planned to roll out its €1.2 million smart meter installation project in 2021, with the aim of reaching its target by 2023[100]. However, the roll-out has been rescheduled in the second half of 2022 (to all users that use 1000 kW+). It is expected that by the end of 2023 80 % of all electricity will be accounted for by smart meters. A good example in Eastern Europe is Latvia which had a smart meter penetration rate of 73% in 2020 (see box below).[101]

For a successful rollout, it is important to deal in a very sensitive and planned way with privacy issues, antitrust and other legal requirements, since some parts of the society are reluctant to install them in their homes. In **Germany**, for example, the Higher Administrative Court of North Rhine-Westphalia in Munster provisionally halted a rollout due to non-compliance with some legal requirements according to an action being brought by a company in Aachen.

95 Eclareon, 2022, p. 67
96 Berg Insight (2021)
97 Ibid.
98 Vitello et al, 2022
99 dso-facts-and-figures-11122020-compressed-2020-030-0721-01-e-h-6BF237D8.pdf (eurelectric.org)
100 Berg Insight, 2021
101 dso-facts-and-figures-11122020-compressed-2020-030-0721-01-e-h-6BF237D8.pdf (eurelectric.org)

7.4. Practices

7.4.1. Bad practices

Germany

The **German** Federal Office for Information Security (BSI) declared that only certain approved smart meter gateways, which meet the requirements for system functionality and security, may be installed. The Higher Administrative Court in Münster interpreted that decision as unlawful and lifted the obligation to install smart metering systems by emergency order. This situation has created uncertainty with regard to the roll-out of smart meters in Germany and a general discussion has started, which has been expanded to other topics such as privacy issues. However, later amendments to the German Metering Point Operation Act have led to the legitimation of the gradual smart meter system rollout in Germany.

6.4.2. Good practices

Sweden

In **Sweden**, we can find two year courses for design of PV systems within the Higher Vocational Education (Yrkeshögskolan) given by some regional schools together with PV companies.[102]

Spain

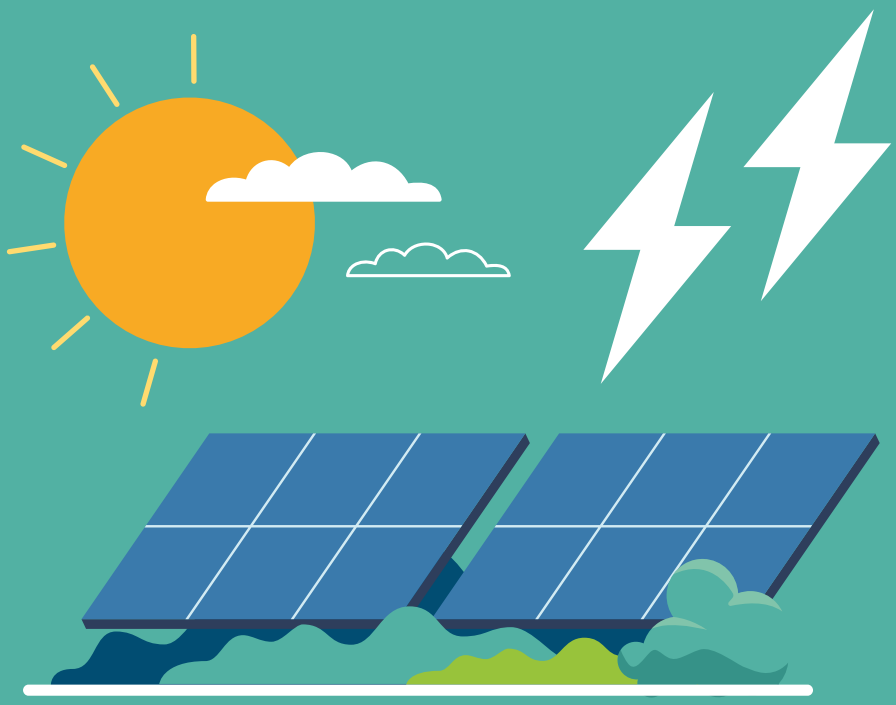
In Spain, the recently approved roadmap on self-consumption includes more than 30 measures, some of them directly related with the mentioned above in this chapter:
Measure 4- Publication of guidelines for municipalities to promote self-consumption
Measure 5- Publication of technical guidelines for professionals
Measure 6- Awareness and dissemination campaigns
Measure 7- Creation of the self-consumption office
Measure 8- Training courses to improve technical skills of professionals
Measure 10- Adaptation of training and curricula in vocational training courses, university diplomas, etc.
Measure 31- Boosting access to energy data for citizens

Latvia

In **Latvia**, the rollout of smart meters will be completed by 2023 for 98% of residential and commercial connections[103]. The Latvian DSO is implementing several digitalisation projects, including the national energy data hub, to increase the flexibility of the grid and enable a wider adoption of prosumerism. Recently, the DSO published the first open data set[104] with anonymised smart metering data. From a broader perspective, Latvia's Recovery and Resilience plan[105] will allocate €80 million to the modernisation of transmission and distribution grids in order to adapt to the new requirements of e-mobility and prosumerism.

102 For more information Find education - University of Applied Sciences (yrkeshogskolan.se)
103 Development plan of the power distribution system 2020-2031. DSO "Sadales tīkls"
104 https://sadalestikls.lv/lv/inovacijas
105 https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility/latvias-recovery-and-resilience-plan_en

8. Conclusions



Solar PV has enormous potential and it is expected to become the main source of electricity generation from 2030 onwards

Solar PV has enormous potential and it is expected to become the main source of electricity generation from 2030 onwards[106] due to its versatility, modularity, cost-competitiveness and adaptability to small and large projects. A Joint Research Centre analysis[107] shows that **rooftop PV** in the EU could potentially produce 680TWh of solar electricity annually representing 24.4% of the electricity consumption (based on 2016 levels). Furthermore, investments in rooftop solar PV in general generate the most jobs per million euros of capital investment, lower energy bills and do not compete with alternative land uses.[108]

Even though there is a lot of potential for rooftop solar PV, the right regulatory framework to ensure full potential and expansion of this technology is not yet in place in every Member State.

In this report, we have detected barriers **at national level** that mean that the right incentives are not in place for a higher uptake of solar, we have highlighted good and bad practices and identified recommendations for setting up the right regulatory framework and enabling environment for the uptake of rooftop solar PV.

According to this analysis, Member States should:

Governance

- Formulate strategies with ambitious goals and clear targets based on an **assessment of barriers and the potential** for the uptake of rooftop solar PV.
- Create **permanent institutional mechanisms** with the participation of a wide range of relevant stakeholders and governmental levels that contribute to the follow up of rooftop solar PV policy.
- Establish and provide sufficient funding to local and regional renewable agencies and entities which support citizens, SMEs and local authorities.

Incentives: support schemes, taxes and subsidies

- Fully transpose the RED II **entitling renewable self-consumers to receive a stable remuneration, including through support schemes, where applicable**, for the self-generated renewable electricity that they feed into the grid. This should reflect the market value of that electricity and take into account its long term value to the grid, the environment and society.
- **Reduce taxes** to a minimum and subsidise solar panels, particularly for energy communities and low income, energy poor and vulnerable households.
- Stimulate self-consumption including promoting the **integration of solar systems with batteries** as one of the flexibility options.
- Consider **mandatory solar PV** on all new and renovated buildings, apartment buildings, under certain circumstances, following the energy efficiency first principle.

Permitting and administrative procedures

- Remove construction permits and substitute them with notices or reports on the start of activities for installation of rooftop solar PV.
- Enhance **one stop shop or single permitting procedures** for administrative and grid connection procedures and digitise administrative procedures
- Grid tariffs and network charges should be reduced as far as possible, applicable only to the extent to respect the cost reflective principle
- Introduce a registry of small installations to keep track of the evolution of rooftop PV.

106 Solar Power and Lut University, 2020
107 Bodis et al, 2019
108 IEA, 2020.

Energy sharing and collective self consumption

- **Allow for both energy sharing** (through the distribution grid) and **collective self consumption** by transposing and implementing the RED II.
- Reduce the minimum to proximity and size requirements that pose barriers to energy sharing and collective self consumption that pose barriers to such development.
- Establish flexible options for stakeholder participation in collective schemes in order to mobilise investment, new business models and the needed social acceptance among citizens.
- Energy sharing and collective self consumption in **apartment buildings** or similar structures should be feasible **without the need to create an energy community**.

Energy communities

- **Transpose RED II and the Electricity Market Directive (EMD)**, including developing the definitions of renewable energy communities and citizen energy communities and providing comprehensive and coherent enabling frameworks.
- The criteria of the EU definitions should be reflected and developed clearly in detail in national legislation (openness and voluntary participation, autonomy, effective control, geographical proximity)
- Designate an authority to follow up and monitor the implementation of the objectives and provisions for energy communities
- Put policies and measures in place to support the incorporation of energy poor, low income and vulnerable households into the design of both RECs and CECs.

Additional measures

- Launch **awareness campaigns on benefits of rooftop solar PV** to the wider public and ensure easy access to information
- Develop renewable energy **training programmes** for administrative staff, national, regional and local policy makers; as well as support programs to ensure sufficient and well **qualified installers**, energy planners and architects
- Roll out **digital meters** with access to data for energy users to facilitate efficient (collective) self-consumption schemes and grid integration, while ensuring data privacy protection.
- Prepare the distribution grid for a massive roll-out of solar PV and self-consumption, in the context of mobilising all flexibility options.

The application of these measures should contribute to creating the decentralised and democratised energy model promoted by the clean energy package, where citizens and communities can play a more active role and take control of their energy resources. It is crucial to highlight the importance of the empowerment and engagement of community members that will contribute to boosting proliferation of rooftop solar PV across Europe. This shift will enable citizens to benefit from the decrease in solar energy costs while addressing the challenge of energy poverty.

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Annex 1: Methodology and structure

The report has drawn upon qualitative information and data provided by CAN Europe members and additional desk research. The focus countries and CAN Europe members involved in the elaboration of the report include a wide variety of territories with different socioeconomic conditions and degrees of development regarding rooftop solar PV policy measures:

Focus Countries		Members Involved
1.	Greece	The Green Tank
2.	Sweden	AirClim
3.	Portugal	ZERO
4.	Lithuania	VšĮ Žiedinė ekonomika (Circular Economy)
5.	Spain	Ecounion, SEO/Birdlife, Fundación Renovables
6.	Latvia	Green Liberty
7.	Germany	DNR, WECF
8.	Italy	Legambiente
9.	Bulgaria	Visiaw commissioned by Greenpeace Bulgaria
10.	Romania	Greenpeace Romania
11.	France	CLER-Réseau pour la transition énergétique
12.	Europe	Friends of the Earth Europe
Expert Support		
REScoop on energy communities		

The outcome of the report seeks to compare national frameworks in a short and concise way, including the identification of barriers, good practices and policy recommendations. It also provides a scoring assessment based on the perceptions of CAN Europe member organizations. In order to achieve such an outcome, a semi structured questionnaire was prepared by CAN Europe with guiding questions that cover the above mentioned elements of comparison. The questionnaire received replies from by at least one national CAN Europe member organisation listed in the above table. In some countries, two or more organisations have been involved in the process and agreed on a joint response. The questionnaire includes scoring questions, where CAN Europe members have identified a numeric value as a response. National responses and numeric values have been cross checked in order to give consistency. The information has been processed and key policy recommendations, good and bad practices have been formulated accordingly.

Based on the responses of the questionnaire, we have divided the structure of the report into the following topics:
- Governance aspects
- Incentives: support schemes, taxes and subsidies
- Permitting and administrative procedures
- Energy sharing and collective self-consumption
- Energy communities
- Additional measure to support the development of solar PV.

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