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Electricity market design

FIT FOR NET ZERO

Eurelectric policy recommendations

Knowledge Partner

COMPASS LEXECON

Executive Summary

The transition towards a net-zero economy by 2050 requires stepping up the volume of investment across the energy sector and end use sectors, while ensuring better engagement and protection opportunities for consumers. This study aims to address these challenges and contribute to the ongoing debate about electricity market design to make it fit for the energy transition.

The energy crisis triggered by the conflict in Ukraine has demonstrated the resilience and benefits of an integrated European market. Yet, the crisis has also highlighted some of the gaps in the current market design and the need to pass on the benefits of renewables' and other low-carbon technologies' stable generation costs more directly to consumers.

In this report, we present an analysis of the key gaps in the current market design with recommendations to complete the set of existing markets to support an efficient transition toward net zero over the next decades. The market design reform will need to preserve the cost-efficiency and national and cross-border competition delivered by the internal EU energy market by building on the current market framework.

Policy recommendations put forward in this report focus (i) on the **proper implementation of existing EU legislations and regulations,** (ii) on the **removal of barriers and obstacles** and (iii) on **market-based solutions to reinforce incentives** for stakeholders to contribute to the challenges faced by the power system and to achieve the transition towards a net-zero economy. These recommendations were carefully defined to foster consumer engagement, maintain the efficiency of price signals, and improve transparency, liquidity and competition for all timeframes. On the contrary, measures that would be detrimental to these objectives would be counterproductive and should be avoided.

To reach these recommendations, the study started in June 2022 and has followed a structured and interactive approach to analyse the key gaps in the current market design, and to identify potential solutions. The study is built upon many interactions with Eurelectric's members as well as external stakeholders.

These policy recommendations are structured in three main pillars: (i) a **consumer contracting and engagement framework** based on enhanced forward hedging opportunities and retail price structures, (ii) an **investment framework** underpinned by enhanced long-term hedging/contracting opportunities, and (iii) a **framework to coordinate the future system needs** to meet security of supply and policy objectives.

An enhanced customer contracting framework – enabling sufficient possibilities for generators, customers, and suppliers to hedge and contract, including over the long-term – would bring the benefits of renewable energy sources (RES) and low-carbon generation more directly to consumers, while still providing efficient short-term signals fostering active demand participation in short-term markets. This enhanced hedging framework will be required to:

1. Guarantee adequate information for consumers and sensibilisation to risks so they may commit for longer periods;

2. Ensure suppliers' resilience to avoid rapid, unexpected market exits and consumers losing their suppliers unexpectedly;

3. Enhance hedging opportunities to protect consumers against medium-/long-term price volatility (beyond one year); and

4. Empower consumers further and facilitate demand-side response.

A market-based **investment framework** is necessary to step up deployment of both renewables and low-carbon technologies, as well as firm and flexible resources (including demand-side response and storage), and the supporting network infrastructure. The framework for RES and low-carbon investment should allow investors to choose or combine whether to enter public de-risking contracts, to enter private power purchase agreements (PPAs) or other forms of private contracts, or to participate in the electricity market directly. The investment framework should provide revenue stabilisation opportunities though long-term contracts to foster investment and reduce financing costs while preserving effective incentives to participate in the forward, spot, and balancing markets. Different types of measures identified to enhance long-term contracting include:

1. A role for capacity mechanisms as a core part of the market design to ensure adequacy and security of supply, and facilitating their implementation for Member States that would opt for such mechanism;

2. A private framework for RES and low carbon contracting, usually referred to as PPAs, which would aim at removing barriers to PPAs and improving transparency and standardisation, and potentially reduce counterparty risks and actively drive demand if Members States elect to provide active support;

3. A public framework for RES and low-carbon investment with the evolution of RES support schemes toward de-risking schemes that should be designed to bring the benefits of long-term contracting to consumers and to minimise distortions in the market; and

4. Facilitating hedging through the improvement of forward markets by e.g., removing barriers to hedging on forward markets.

Last, an enhanced **framework to coordinate the identification of the future system needs** is required for the timely development of sources of flexible and firm power, as well as key networks and infrastructures alongside the growth of clean technologies. New opportunities will emerge, both on the supply side with new storage technologies, and on the demand side with new flexible loads from the electrification of the transport, industry, and buildings sectors. An enhanced framework for assessing, in a forward-looking and in a holistic way, the evolution of system needs is therefore necessary to provide visibility for market participants and network operators, by:

1. Expanding the scope of system needs assessment to have a 'whole system' perspective, to include wider system needs (network, firm capacity, flexibility), cross-sector assessments and for a longer timeframe, such as 2040 and 2050;

2. Improving the current methodologies used in system needs assessment, to better adapt to a changing energy system; and

3. Reviewing the governance arrangements to conduct the system needs assessment, accounting for cross-sector, distribution level, stakeholder inputs.

Introduction

European power markets have gone through unprecedented challenges in the past few years due toto the gas supply shortage associated with the Russian aggression against Ukraine. Whilst the crisis demonstrated the resilience and benefits of an integrated European market, it also highlighted some areas for potential improvements of market design and has led some policy makers to call for a reform of the European electricity market. The consultation launched by the European Commission has provided some initial guidance on the areas of focus to reform European electricity markets.

The study aims to **contribute to the EU policy debate on the reform of the European electricity markets.** This study identifies ways in which current European power markets could be completed with a range of additional measures to address some of the challenges and gaps identified, and deliver the policy objectives of decarbonisation, whilst maintaining safe and affordable energy supply.

Preamble on the study interaction with the short-term 'energy crisis'

As a starting point, it is essential to recall a few fundamental points in relation to the current energy crisis and key guiding principles.

First, **the current market design is not the root cause of the high electricity prices witnessed in 2022 and 2023 in Europe.** On the contrary, the integrated European market has delivered significant benefits to consumers. The current energy price crisis is the result of a gas supply crisis that is having major contagion effects on electricity prices, while most of the interventions and measures adopted in the EU are focused on the electricity market.

However, the energy crisis has revealed the need to provide more instruments to pass on the benefits of renewables' and other low-carbon technologies' lower generation costs more directly to consumers. This in turn will require a greater role in the market for long-term hedging instruments and contracts.

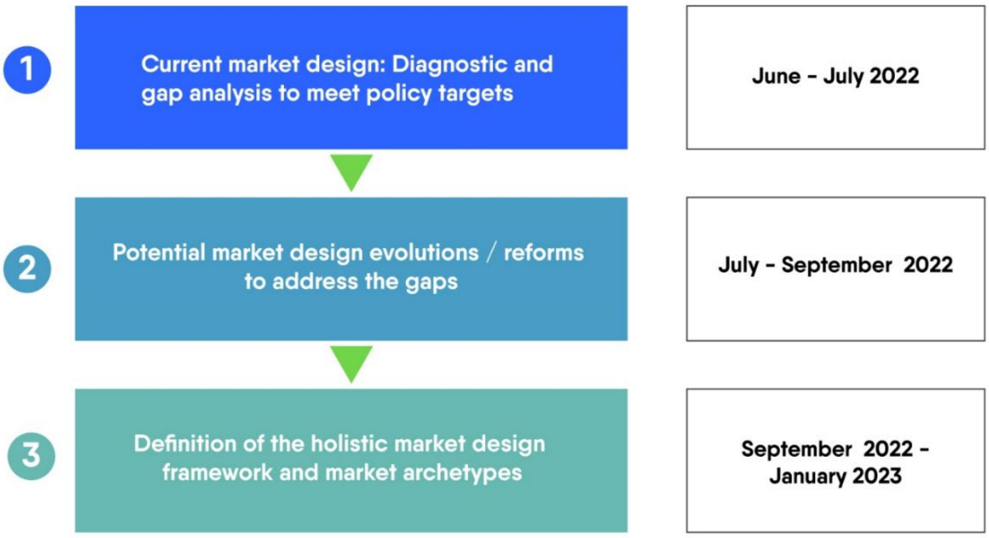
Renewable and low-carbon energy sources can offer energy at relatively low and stable costs. However, their potential advantages for the customers may not always be visible in the consumers' bills due to the influence of short-term price signals on forward prices. As a result, most customers do not perceive the full benefit of renewable and low-carbon energy sources, and this has led to policy interventions such as inframarginal price caps. In parallel, the development of variable renewable energy sources also creates challenges regarding the operation of the power system and the security of supply. In particular, potential reforms of the market design should not hamper recent regulatory and market developments to foster flexibility and demand-side participation, which are key to cope with these challenges.

Second, a market design review for the long term should not be rushed and its impact should be adequately assessed. Some of the proposals that have been discussed in recent months have the potential to be profoundly disruptive for the current integrated energy market, such as decoupling short-term wholesale electricity prices from gas prices, changes in the market design derived from the various Member States' crisis-related interventions, or the introduction of differentiated remuneration for each generation technology based on its 'true production costs'. Such proposal could lead to significant negative impacts on cost-efficient dispatch and security of supply, without ensuring a more resilient market design for operators, investors, and consumers.

Moreover, it is particularly important to distinguish emergency measures and structural solutions, and to stress the need for regulatory stability and predictability. Temporary measures and market interventions should not be extended beyond the period foreseen by the Council Regulation on an emergency intervention to address high energy prices. Although the structural reform should not be rushed, policy makers should consider the fact that the policy and regulatory uncertainty associated with the ongoing debates and short-term interventions are harming investment and could undermine Europe's efforts to attract investment to decarbonise. On the contrary, the market design should provide an adequate framework to guarantee investors' confidence to ensure the necessary investments in renewable and low-carbon technologies, maintaining the system's balance, fostering sector integration, and contributing to security of supply.

The study approach and methodology

The study has followed a structured and interactive approach to analyse the key gaps in the current market design, and to identify potential solutions. The study is built upon many interactions with Eurelectric's members as well as external stakeholders: twelve steering committees, more than twenty core team meetings, presentations to the Customers and Retail Services and Markets and Investments Committees and to Eurelectric's wider Structure of Expertise, external workshops with industrial consumers, and EU stakeholders were organised along the course of the project.



- The first phase focused on the evaluation of the status quo in the light of the policy objective to decarbonise. A systematic mapping of the key strengths of the current market design and gaps to be addressed was conducted on six main topics: (i) wholesale markets, (ii) balancing markets (iii) the investment framework, (iv) retail markets, (v) networks, and (vi) sector coupling.
    - As part of this phase, the scope of the market design review was focused on issues relating to wholesale, retail, investment, and sector coupling. This is because network and balancing issues were already extensively covered externally.
- The second phase of the study introduced the key principles of a market design that would address the challenges and gaps identified, building on the current market design; several case studies were discussed looking for potential lessons from other countries around the world that have faced similar issues.

    - This included practical case studies such as energy-only markets (Australia, Texas), capacity mechanisms (PJM), long-term contracting mechanisms (Chile, Brazil), European market mechanisms' overviews as well as new market design approaches developed by academics or practitioners, such as the Greek model proposal, the Green Power Pool (UCL), Equivalent Firm Power auctions (Dieter Helm), decentralised obligations (Energy System Catapult), etc.

- The third phase of the study consisted of identifying the key principles of a new market design building on the existing internal energy market; and on defining a list of concrete policy recommendations corresponding to each of these principles.

The structure of this report mirrors this sequence:

- The first section introduces the evaluation of key strengths of the current market design and gaps to be addressed;
- The second section introduces the key principles of a market design that would address the challenges and gaps identified, building on the current market design;
- The third section provides, on each of the key pillars of the new market design proposed, a list of concrete policy recommendations.

Gap Analysis of the current market design

In this section, we review the current market design arrangements:

- The first section covers the key strengths of the current market design, focusing particularly on short-term wholesale markets;
- The second section reviews the key gaps in the current market design, particularly looking at (i) consumer engagement and protection, (ii) investment and (iii) the coordination of future system needs.

Key strengths of the current market design

As we look back at the past 20 years and the current status of EU wholesale markets, it is important to emphasise the success of the integration of EU wholesale energy markets, which brings benefits to consumers.

The short-term wholesale market is essential for an efficient functioning of the power system and has ensured efficient dispatch of generation and flexibility assets, efficient cross-border trading, and therefore, reduced volatility despite the exceptional circumstances of the energy crisis. The integration of EU wholesale markets based on the merit order and marginal pricing principles have unlocked major benefits for consumers. In 2021 alone, ACER[1] estimated the benefits of cross-border trading to amount to €34 billion due to increased dispatch efficiency. It is worth noting that more than a third of these benefits were delivered in the last quarter where energy prices were the highest.

[1] Based on analysis conducted by NEMOs. Source: ACER (2022) ACER's Final Assessment of the EU Wholesale Electricity Market Design.

Further, the current market design has allowed for a significant reduction in short-term market volatility during the crisis, with higher convergence across EU markets. ACER[2] estimated the price volatility would have been about seven times higher in 2021 if national markets had been isolated. Building on these strengths, more reforms are currently underway to further improve short term markets such as the integration of balancing markets or increased demand-side response participation.

The EU electricity market integration has also improved system resilience through stronger coordination and solidarity, which has been demonstrated during the energy crisis, but also in previous events which could have put the EU power system in jeopardy. As such, cross-border trading, integration of balancing markets and regional coordination centres have contributed to higher standards of security of supply across the EU.

However, market integration is still in progress. Further short-term market integration (intraday and balancing), the full implementation of all services to be provided by regional coordination centres, further improvements in cross-zonal capacity calculation and better coordination of capacity mechanisms will also yield substantial additional benefits.

The current wholesale market design is built to ensure the generators are dispatched based on short-run costs to minimise total costs. In short-term markets, the electricity price is determined at the marginal price, i.e., the variable cost of the last generator being asked to produce at a given time. Through the spot markets, generators are ranked according to their short-term costs in the merit order, and only the cheapest generators are selected to reach demand.

There is no better alternative to the marginal cost dispatch mechanism. With growing decentralisation of renewables, preserving the current short-market functioning will be key to ensuring the efficient real-time dispatch of generation and flexibility assets and demand-side response, as well as efficient cross border exchanges of electricity. As a result, the current short-term markets should remain a central pillar of any new market design and initiatives aiming at further improving them should be pursued.[3]

Key gaps of the current market design

The recent energy crisis has highlighted some of the weaknesses and gaps of the current electricity markets. The starting point for identifying the key gaps in the current market design in the study was based on a set of core foundational principles:

- **The market design needs to recognise the evolution of policy objectives since the 1990s**. A market design is never conceived in a vacuum and is expected to deliver some specific policy objective. In this perspective, the study has mapped the evolution in the context and objectives since the current EU electricity market was designed 20 years ago, with a growing focus on decarbonisation, while reducing the EU's dependence on imported fossil fuels.
- **The market design needs to enable the deployment of the resources necessary (clean technologies and flexible resources) for the energy transition.** The transition will create new operational challenges associated with the rising share of variable renewables technologies.

[2] Ibid.

[3] The improvement of the short-term market functioning is beyond the scope of Compass Lexecon study. However, some suggestions can be found in various Eurelectric publications – see for instance Eurelectric's response to the European Commission consultation on market design (p20-21), in particular its request for a closer to real-time Cross-Border Intraday Gate Closure Time to better balance surpluses/shortages and on the need to assess carefully and with transparency the impacts of ongoing integration projects and in future considerations.

The market design will need to recognise in a differentiated way the different attributes of different technologies and their respective contribution to the system's safe operation. Moreover, most clean technologies and flexible resources require large CAPEX investment, which suggests that a specific focus on the investment framework for capital intensive technologies is needed. There is also a need to properly recognise challenges ahead for networks to connect more renewables.

- **The market design needs to take a holistic cross-sector perspective and coordinate substantial investments** within a short timeframe across the power sector, related infrastructures and end uses, which are electrifying. The institutional and governance arrangements that support infrastructure planning and end use sectors will therefore also need to evolve to support an efficient market functioning.

- **The market design needs to benefit consumers and support their active engagement.** New technologies allow active participation in the market of demand as well as decentralised resources. Consumers need to see the benefits of the investments in clean technologies through electricity prices and hedging approaches that provide both choice and adequate protection.

These starting principles have formed the basis of our analysis of the specific challenges and gaps in the current market design. Accordingly, the next paragraphs present in more detail the key gaps with (i) consumer engagement and protection, (ii) the need for a framework to support investment and (iii) the coordination of future system needs.

Consumer engagement and protection

A large share of energy consumers is not engaged in the market. This can be due to e.g., the lack of information or awareness of risks and opportunities, retail pricing structure, barriers to the development of explicit demand-side response (DSR) or policy interventions distorting consumer price signals. For example, while smart meters are often a prerequisite to consumer engagement in operational timeframe, only 54% of European households had a smart meter by the end of 2021[4], with significant divergences between Member States in terms of roll out.

The Clean Energy Package set the focus on consumer engagement with a series of measures to empower consumers and facilitate demand-side flexibility.[5] Consumers could therefore be more reactive to market prices, which could contribute to alleviating future crises. These measures are not yet fully implemented in all the Member States or need to be further clarified before implementation. For example, the participation of explicit aggregation of demand-side flexibility is not allowed in all European energy markets and capacity remuneration mechanisms.

Exceptional energy price volatility triggered by the gas supply crisis has impacted customers and has highlighted the need to assess the resilience of our current electricity market design to such external shocks, notably in terms of customer protection and engagement. In the meantime, policy makers have introduced short-term policy interventions, which aim to address such exceptional circumstances and mitigate the impact on customers.

For example, retail prices have increased for household consumers. Compared to September 2021, the average estimated EU retail electricity price for small household consumers in September 2022

[4] ACER-CEER (2022) Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2021

[5] European Commission (2019) Clean energy for all Europeans package.

increased by 25% to 26.3 c€/kWh.[6] This increase occurred despite the retail market interventions carried out in all EU Member States to protect customers, such as with direct aid for energy costs, tax relief, network tariff exemptions/reductions, or retail price regulation. These interventions come at significant costs: €600.4bn was allocated across the EU[7] to protect consumers against energy costs between September 2021 and November 2022.[8]

EU industrial competitiveness has been negatively impacted at a time where the energy transition requires major decarbonisation and electrification investments. Compared to September 2021, the average estimated Q3 2022 EU retail price for small industrial consumers[9] rose by 40% to 22.8 c€/kWh, and by 64% to 18.6 c€/kWh for larger industrials.[10] This increase is higher than in EU trading partners, such as China (where industrial prices increased by 15% year-on-year), or the United-States (drop by 3% year-on-year).[11]

In their vast majority, consumers currently do not have commitments with their suppliers beyond one to three years and do not engage in long-term contracts with producers. This may be due to the lack of information, to the inability or the lack of interest to commit over long periods, or to legal or regulatory hurdles. This limits the ability of suppliers to hedge on their behalf over the long term and to provide them with price stability over a longer period of time. Consumer awareness and access to information could be improved to increase interest in hedging and ensure that they understand the risks they are exposed to in their contractual arrangements. Last, as shown in the energy crisis, the lack of financial resilience of certain suppliers can lead to unfavourable circumstances for consumers.

Coordination of future system needs

The current EU framework for long-term studies[12] is insufficient to effectively inform policy makers, investors, and other stakeholders and coordinate the large-scale investments required to reach European Green Deal objectives, the transition to a climate-neutral economy by 2050 and increase Europe's energy independence from unreliable suppliers and volatile fossil fuels. While the current framework has started to evolve to cater to these new challenges, gaps remain in the system needs framework.

Currently, the key EU long-term studies focus primarily on electricity and gas network expansion (TYNDP) and power adequacy (ERAA). The TYNDP has started to develop a 'system need' perspective, with flexibility assets (storage and CO2-free peaking units) as an additional investment option for the 2040 horizon to address network-related issues.[13] The focus remains narrow, covering only partially the different system needs, such as flexibility (long-term, short-term), or stability. The ERAA would benefit from (i) more detailed granularity of grid constraints to improve consistency between EU and national analyses and (ii) methodological enhancements to ensure the economic viability of resources. Further, the time horizon of 10 years is too short for the path to net-zero.

[6] European Commission (2022) Quarterly report on European electricity markets.

[7] This amounts to €705.5bn for Europe, with €264bn earmarked by Germany.

[8] Bruegel (2022), National fiscal policy responses to the energy crisis. Consulted on 27 January 2023.

[9] Band IB - The annual consumption of small industrial consumers falls in the range of 20 MWh to 500 MWh. This consumption band is defined by Eurostat as IB.

[10] European Commission (2022) Quarterly report on European electricity markets.

[11] Ibid.

[12] Such as the Ten-Year Network Development Plan (TYNDP) of ENTSO-E and ENTSOG and the European Resource Adequacy Assessment (ERAA) of ENTSO-E.

[13] ENTSO-E (2023) TYNDP 2022 - Opportunities for a more efficient European power system in 2030 and 2040.

Further, the studies often lack a comprehensive vision from a full energy system perspective, especially the end uses. Given the cross-sector interdependencies, with electrification and gas network transformation, coordination is key beyond electricity and gas transmission system operators (TSOs) – to include hydrogen, end-uses, and distribution system operators (DSOs). This dimension has already been identified to some extent, with ENTSO-E and ENTSOG recently launching a joint initiative for a multi-sectorial Planning Support, but this is limited to the gas and electricity sectors, and with a planned implementation only in 2028.[14] This framework needs to develop earlier, given the urgency of efforts required to meet policy targets, and be accompanied by a robust governance framework.

Investment framework

An investment framework is lacking in the current market design to support capital-intensive large-scale investment in clean technologies. To reach REPowerEU targets, substantial investment is necessary in renewables. The EC analysis indicates that REPowerEU alone needs €300bn of investment by 2030, in addition to the Fit-for-55 investments needed. The latest Commission Staff Working Document shows that 510 GW of wind and 592 GW of solar photovoltaic (PV) will be needed to reach REPowerEU targets by 2030.[15]By comparison, in 2020, installed wind capacity amounted to 175GW, and 100 GW for solar PV.[16] Moreover, investments of about €350-450bn will be needed in the coming decades to maintain the same nuclear capacity in the EU.[17]

Given the significant investments needed in renewables and nuclear, it is necessary to build an enhanced and more consistent investment framework which will articulate a growing role for private long-term contracts with a continuation of public de-risking arrangements where necessary. Long-term contracts are the anchor of an investment framework, as they support efficient risk allocation. This de-risking acts to reduce the cost of financing, and ultimately the costs for consumers.

The further development of private contracting will be key to face this investment challenge, such as with Power Purchase Agreements (PPAs). In addition, support schemes for clean technologies will continue to play a role in de-risking investment in some technologies and need to evolve to limit potential distortions in power markets and to make them resilient to potential policy interventions. Private and public long-term contracts also allow consumers to hedge prices directly or indirectly through their suppliers.

However, there are several shortcomings in the current public and private long-term contracting arrangements that need to be addressed.

PPAs face legal, regulatory, informational, and economic issues. In the past decade, 26.2 GW of PPAs have been signed across Europe.[18] However, this uptake has been concentrated in a few countries, as more than 50% of these PPAs have been signed either in Spain or the Nordics.[19] This uptake has been facilitated by specific policies in these countries, like public guarantees,[20] or PPA sourcing

[14] ENTSO-E (2020) ENTSO-E Roadmap for a multi-sectorial Planning Support.

[15] European Commission (2022), Implementing the repower EU action plan: investment needs, hydrogen accelerator and achieving the bio-methane targets.

[16] Eurostat, EU 27.

[17] European Commission (2022) Opening speech by Commissioner Simson at the 15th European Nuclear Energy Forum in November 2022.

[18] RE-Source (2023) RE-Source Renewable Energy Buyers Toolkit data (as of 26/01/2023).

[19] Norway, Sweden, Finland. See CRE's 2022 commissioned consultant study on public support for PPAs in Europe for more detail. (In French) and The Corporate PPA tool by WindEurope.

[20] Spain, Norway.

obligations on large electro-intensive users.[21] More than 60% of these European PPAs have been signed in either heavy industry or the information and communications technology (ICT) sector by large companies,[22] showing that these contracts are not attainable by or suited to all off-takers.

The energy crisis has also heightened the regulatory and political risks of support schemes. As shown by the recent crisis, mechanisms designed with uncapped upside revenues in case of high prices may not be resilient and could trigger future policy interventions. Indeed, ex-post changes to support schemes, including revenue clawback in times of upsides, lead to greater risks for investors. Conversely, the design of support schemes can also mitigate risks of alleged 'windfall profits', as well as better protect consumers against short-term price variations.[23]

Further, the growing share of renewables stresses the importance of the interaction between support schemes and market mechanisms. Depending on their design, these schemes can create market distortions affecting short-term dispatch and long-term investment levels, as well as create an uneven playing field across EU generators in the single market. The costs linked with these distortions increase with the penetration of renewables.

Moreover, although new assets could in theory secure the sale of their output in forward markets, and therefore at least part of their investment, the participation in forward market is not relevant in practice to secure investment nor support capital-intensive large-scale investment in clean technologies. Indeed, hedging on forward markets is often hindered by low demand for long-term hedging, liquidity issues, and difficulties to hedge across borders. As a result, there are only rare options in Europe to trade over more than three years in forward markets – and no options beyond ten years – and the liquidity of these products is low.

The lack of forward markets liquidity in small bidding zones was identified by ACER as 'the most important problem'.[24] Liquidity is uneven across bidding zones, limiting the ability to adjust hedges across time in less liquid markets. For example, mature markets like Germany have a churn[25] factor of 7.5, compared to Slovakia, Greece, Belgium, or Hungary with churn below 0.5 in 2021.[26] This leads to higher bid-ask spreads for smaller bidding zones which increases the cost of hedging.

There is low demand for long-term forward hedging from suppliers, due to uncertainties on their long-term consumer portfolio. As a result, forward power markets lack liquid products to hedge beyond 2-3 years, even in bidding zones with mature forward markets. This is true even in Germany, the most liquid forward bidding zone in the EU, which has very low volumes of forward products beyond three years, with all liquidity concentrated on the 1–3-year timeframe.

The energy crisis has shown the importance of security of supply and the need for a closely-knit EU coordination. Today, there is a patchwork of capacity remuneration mechanisms across Europe, showing the lack of harmonisation principles leading to their convergence. Capacity remuneration mechanisms have been introduced across Europe with marked differences: capacity payments introduced in some countries following the liberalisation of the market, decentralised capacity

[21] Spain.

[22] For example, Google, Amazon and Facebook hold more than 27% of all European PPA contracted capacity. Source: RE-Source Renewable Energy Buyers Toolkit data (as of 26/01/2023)

[23] For instance with to two-sided contracts for difference, consumers get compensated when prices exceed the contract strike price.

[24] ACER-CEER (2022) ACER-CEER Draft Policy Paper on the Further development of the EU forward market.

[25] Churn factors are a common measure of liquidity in power markets, defined as the total traded volume divided by the demand of the market zone.

[26] ACER-CEER (2022) ACER CEER Wholesale Electricity Market Monitoring 2021, Progress of European electricity market integration.

market (France), regionalised capacity markets (Italy), strategic reserves (Germany), capacity market accounting for local congestions (Ireland), etc.

With the expected further growth of variable renewable generation, there is a need for capacity to cover the residual load, potentially with a less frequent utilisation than in the past. However, despite the roll out of these mechanisms across Europe, they are temporary, their implementation is complex, are only allowed as a last resort measure, and are subject to state aid clearance. This creates uncertainty on their stability. The current market design lacks a clear EU-level framework on capacity mechanisms, which grants visibility and stability to investors.

Key market design principles

A market design that will support an efficient transition toward net-zero over the next decade needs to **preserve the cost-efficiency and national and cross-border competition** delivered by the internal EU energy market by building on the current market framework, through the following key principles:

1. **Providing an enhanced customer contracting framework enabling sufficient possibilities for generators, customers, and suppliers to hedge and contract, including over the long-term. This could bring the benefits of renewable energy sources (RES) and low-carbon generation more directly to consumers, while fostering their engagement.**

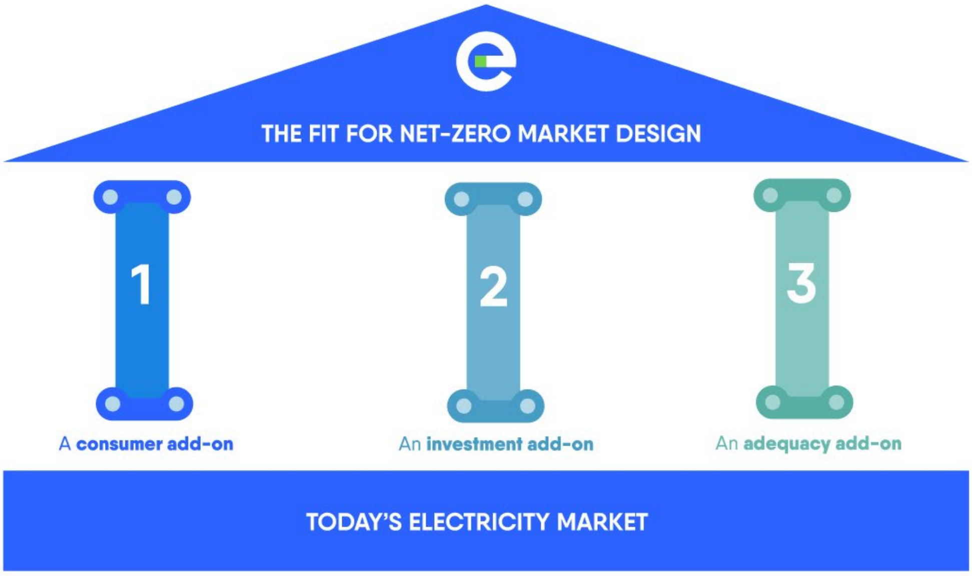
    - In all countries, customers should have the possibility to access a variety of pricing and supply offers, including not only dynamic pricing but also long-term contracts. Suppliers and energy service providers are best placed to define these offers to reflect customers' needs, and it is up to the regulation to remove existing barriers so suppliers may design and provide those offers.

    - Rather than "decoupling" short-term wholesale electricity and gas prices, the proposed market design aims to offer a more balanced choice of short- and long-term price signals in retail prices, ultimately supporting electrification.

    - Hedging and long-term contracts can be implemented without removing short-term signals to end consumers, which are key to stimulate the development of demand-side flexibility.

2. **Providing a market-compatible investment framework for both renewables and low-carbon technologies, as well as firm and flexible resources** (including demand-side response and storage), which are capital-intensive technologies. This framework should strike a balance between robust revenue stabilisation and effective incentives to participate in the forward, spot, and balancing markets.

3. **Maintaining adequacy and security of supply and meeting evolving power system requirements**, in particular because of decentralisation and increasing flexibility and firmness needs.



Pillar I: Consumer contracting and engagement framework

Introduction

There is typically a mismatch between the timeframe for hedging between consumers/ suppliers and producers. Whereas generators need to secure part of their revenues over 10-15 years or longer to make necessary investments bankable, consumers tend not to hedge or enter into long-term contracts – except some specific, larger consumers – and suppliers usually do not hedge beyond 1-3 years in the absence of long-term commitment of their customers.

The removal of regulatory barriers to long-term contracting for consumers and the introduction of an enhanced and liquid long-term contracting framework serves as one way for consumers to directly receive the benefits from less volatile energy costs. This is possible while still providing efficient short-term signals fostering active demand participation in short-term markets.

Different consumers have different characteristics, different capabilities, different risk profiles, etc. There is no 'one-size-fits-all' solution, and several options should be made available, from which informed consumers can chose freely, to ensure a resilient and efficient market design.

Large consumers may generally have an interest in long-term hedging and contracting but find it difficult to do so because of credit risk requirements or lack of available products matching their needs. For such consumers, **the basic no-regret proposal is to focus on the removal of existing barriers to long-term contracts** – while in parallel facilitating PPAs as detailed in the next section. This includes removing any legal obstacles, promoting standardisation and transparency, and, where appropriate, reducing credit risk through tools like aggregation and pooling mechanisms or guarantees underwritten or provided by public bodies.

Small consumers may not have an interest in long-term hedging and contracting, but for those who are, they may also be legally prevented from doing so, as well as the retailers who serve them. For such consumers, the key question to be addressed **is how to enable access to long-term hedging and contracting, and to the benefits of RES and low-carbon technologies**, should they be interested or should it be adapted to their risk profile. The potential impact of hedging incentives on the resilience of suppliers and retail competition should be thoroughly assessed, as it can pose relevant problems about the risk exposure of retailers and cost recovery in case of early contract termination.

Finally, this enhanced long-term contracting framework does not substitute the need to foster active engagement of consumers in short-term markets and support demand-side flexibility (either implicitly or explicitly). Retail price structures will need to provide stronger, but differentiated incentives to reflect consumer expectations and characteristics. For example, dynamic pricing – which is already widely applied in some Member States and an important tool for flexibility – might not be suitable for all consumer categories. Critical peak pricing, as well as other time-of-use tariffs provide simpler yet efficient incentives. In all cases, it is important that smart meter rollout and access to the corresponding data is accelerated to allow customers to grasp the benefit of flexibility.

General provisions

1.1 Recommendation: **Introduce a consumer contracting and engagement framework adapted to different consumer segments.**

This framework should include provisions to:

i. **Guarantee adequate information to consumers and sensibilisation to risks** so they may commit for longer periods;

ii. **Ensure suppliers' resilience** to avoid rapid, unexpected market exits and consumers losing their suppliers;

iii. **Enhance hedging opportunities to protect consumers** against medium-/ long-term price volatility (beyond one year);

iv. **Further empower consumers** and facilitate demand-side response.

The need to intervene to foster hedging and the types of measures differs depending on consumers.

i. **Larger consumers:** large consumers may have an interest in long-term hedging and contracting, through their supplier or not, but sometimes find it difficult to do so, depending on their national circumstances. For these users, interventions should focus on the removal of existing barriers to long-term contracts according to Recommendations 1.14 to 1.25 on PPAs and the improvement of forward markets to facilitate their self-protection.

ii. **Smaller consumers:** there are a variety of small consumer profiles, and the consumer protection framework should recognise these differences. While some may be better informed and may choose knowingly to be exposed to market risks, seeking to use their flexibility to respond to price signals and optimise their bills, some may lack information, interest, or means (time, financially, technically) to respond to price signals or hedge.

Adequate information to consumers and sensibilisation to risks

Improving consumers' awareness and access to information could drive engagement in the short term, as well as hedging. Didactic information and increasing 'energy literacy' could drive aggregated PPAs across small users for instance.

In addition, there is a potential to better inform consumers on long-term investment into the energy transition. For example, rooftop solar panels hedge against short term prices through direct electricity production.

Finally, consumers may take substantial risks embedded in the contractual arrangements. They should therefore be adequately informed (Recommendation 1.2).

1.2 Recommendation: **Ensure adequate information for consumers through a strict implementation of Art. 10 of Electricity Directive requiring suppliers to provide fair and transparent general terms and conditions in plain and unambiguous language to consumers on proposed offers, including risks undertaken when signing a new contract.**

Suppliers' resilience

As shown in the energy crisis, supplier failures often lead to unfavourable conditions for consumers. There is a potential to better inform consumer on risk exposure through their suppliers or public communications, which can increase hedging. Allowing National Regulatory Authorities (NRAs) to perform regular stress tests to verify suppliers' financial resilience or their ability to face major changes in market dynamics would better protect consumers against those risks (Recommendation1.3). As hedging mitigates the impacts of price shocks, better supplier resilience would also drive demand for hedging. The measures should adequately reflect the risks actually taken through their offer structures.

1.3 **Recommendation: Consider a flexible resilience framework on suppliers to guarantee their solidity and ensure customers' protection**. This framework could include (i) **regular stress tests** to verify the ability of suppliers to face major changes in the market dynamics; and (ii) **reporting requirements towards regulators** on how suppliers ensure their resilience. NRAs would thus be able to check suppliers' resilience against market shocks either through financial robustness, through risk hedging in consistency with the risks taken depending on the structure of their portfolios and customers' retail price or other means. For instance, consumers opting for dynamic pricing may not require hedging, while consumers with fixed prices would. A prerequisite of this resilience framework is to ensure that barriers to long-term hedging and supply in forward markets are addressed. To do so, Member States could envisage to define such a framework in suppliers' license conditions or in the regulation. Developing guidance at EU level would be useful to facilitate harmonisation of processes and methodologies across Member States and account for the fact that suppliers may be present in various jurisdictions.

Long-term hedging (beyond one year)

In their vast majority, consumers currently do not have commitments with their suppliers beyond 1-3 years and do not engage in long-term contracts with producers or suppliers. This may be due to the lack of information, to the inability or the lack of interest to commit over long periods (e.g. due to the risk of moving out, etc.,) or to legal constraints or regulatory hurdles. Unnecessary regulatory hurdles should be removed (Recommendation 1.4).

The absence of long-term consumer's commitment to suppliers impacts their willingness to engage in long-term contracts with generators. Generally, retail market contracts usually last a few years maximum, as policies have been attempting to increase switching rate for consumers to find the best deals and stimulate competition in the retail market. However, if a supplier engages in a long-term contract (e.g., 10 years), it contracts a set volume and price for the contract period.

As a result, this implies a volume and a price risk for the supplier. To buy electricity over multiple years, the supplier should have a reasonable expectation that its portfolio demand will cover the amounts contracted. In case of too high of hedging, electricity would need to be resold, potentially at lower price. Without guarantees from consumers, buying electricity many years in advance is risky for the supplier, since the customer could leave for another supplier. To facilitate long-term hedging for end consumers, barriers for suppliers should be lifted and, in particular, the right of suppliers to charge cost-reflective termination fees should be explicitly provided for in legislation (Recommendation 1.5).

1.4 **Recommendation: Relieve national legal/ regulatory constraints to long-term consumer commitment with their suppliers** (mostly for smaller consumers). This includes constraints to the signing of long-term retail contracts (which would also include PPAs), in national legislation (e.g., Czech Republic or Spain[27]), or in some cases a too strict application of the competition law, as well as provisions that impede adequate modalities to protect both consumers and suppliers, for instance in case of early termination on both sides of the contract.

1.5 **Recommendation: Lift barriers for suppliers to hedge longer term and offer long-term hedging possibilities for consumers** (mostly for smaller consumers). To hedge over the long run, suppliers need some assurance that they do not over-procure electricity if their portfolio's consumption

[27] Small consumers in Spain are not able to sign contracts with their suppliers over periods of more than a year.

decreases. Long-term assurance of consumer commitment would unlock retail offers based on consumer loyalty.

- **Facilitate the resale of long-term hedged volumes** by making forward markets more liquid and improving Long-Term Transmission Right (LTTRs) allocation (*NB: while covering the volume risk of consumer switching, suppliers would still bear a substantial price risk*).
- **Allow cost-reflective termination fees/other mechanisms for consumers to compensate their previous supplier for hedging costs**. This fee could be determined according to a regulated methodology or determined freely by the supplier before signing its initial contract with the customer. Another approach that could be investigated would be to allow for the new supplier to pay the termination fees on behalf of the consumer to the former one in case of early termination of the initial contract by the consumers. In both cases, regulatory monitoring could be implemented to foster consumer trust. Such termination fees must be in place in case suppliers would have the obligation to offer fixed price contracts.

To go further, some Member States could decide to protect particular consumer segments against market price volatility. To do so, they could implement de-risking contracts, for instance through specific contracting schemes. Eurelectric considers that these additional interventions are not necessary but, should Member States decide to introduce them, Eurelectric considers that this should be delegated to suppliers through competitive auctions and should not lead to a single buyer model. As an example, the so-called 'affordability options'[28] could protect consumers against sustained price spikes and remove the need for intervention seen during the current crisis. However, they raise a number of implementation questions, especially to set the adequate level of the option activation, to define counterparties and to recover costs. Should they be considered, they should be contracted in a market-based way and preventing any distortions in competition.

Empower consumers and facilitate demand-side response

The Clean Energy Package already included a series of measures to empower consumers and facilitate demand-side flexibility. These measures are not yet fully implemented everywhere in Europe or need to be further clarified before implementation, but their implementation should be the priority (Recommendation *1.6).* Moreover, to foster demand-side participation, consumers should have access to an adequate range of offers encompassing short-term incentives (Recommendation 1.7).

1.6 **Recommendation: Implement existing provisions as part of the Clean Energy Package to lift barriers to demand-side response (DSR)**, in addition to completing the smart meter roll out, to allow consumers and aggregators to participate in all market segments. The key enablers for greater consumer engagement should be put in place to allow consumers who wish to and can actively participate in the energy system to do so. This includes:

- **The full implementation of related measures foreseen in the Clean Energy Package:** Articles 13, 15, 17 and 32 of the Electricity Directive already address the rights of aggregation and demand response participation in the market. Before considering additional legislation, we feel the Commission should focus on ensuring the proper transposition, implementation, and enforcement of the existing Articles.

[28] An affordability option is a financial product hedging consumers against too high price spikes, aiming to guarantee that the price paid by consumers remains under a certain threshold, to avoid affordability issues.

- **The sharing of good practice between Member States** to facilitate an efficient implementation and foster harmonisation across the EU.
- **The removal of barriers to DSR**, where relevant, by enabling DSR participation in all electricity market segments and capacity mechanisms. This includes the removal of either explicit (not considered in eligible technologies) or implicit barriers to their participation (e.g., prequalification requirements, product design).

It is worth noting that reforms are already underway with respect to removing barriers to DSR. In December 2022, ACER submitted a draft framework guideline on a new network code on demand response to the European Commission[29] as an additional step towards the implementation of binding EU rules, besides the already existing provisions in both the Directive and Regulation for the Internal Electricity Market.

Beyond these measures, providing adequate short-term signals to consumers would be key to improve the efficiency of the system. The spectrum of offers should go well beyond dynamic pricing to adapt to different consumers' needs and situations.

1.7 Recommendation: **Ensure that consumers can have access to an adequate range of retail offers encompassing short-term incentives**. Thanks to the roll-out of smart meters (and respective data access), these incentives could be introduced in various ways, such as time-of-use tariffs, critical peak pricing, dynamic pricing, and dynamic rebates. NRAs could monitor the market for available choices regarding the types of retail offers and whether there are any regulatory barriers that hinder retailers to offer new products.

Pillar II: Investment framework for generation

Introduction

Massive investments are needed to meet decarbonisation objectives while maintaining high standards of security of supply, ensure affordability, reduce dependence on imported fossil fuels, and address identified system needs. **The investment challenge requires building a stronger framework to support these investments, foster their timely delivery, and facilitate financing.**

These investments include large-scale investment in RES (including wind and PV, but also hydro and other RES) and low-carbon technologies (such as nuclear), as well as in firm and flexible capacities (such as pump-storage and batteries). These also include investment needs at consumer level to electrify end uses and develop decentralised resources.

Long-term contracts play a critical role to support these investments in capital-intensive capacities and technologies. Long-term contracts facilitate financing and reduce the cost of capital, thereby reducing the total cost of investments and benefitting consumers.

In addition, an investment framework enabling long-term contracts must address the question of the adequate counterparties for these contracts. Several options are possible, such as suppliers, consumers, or other entities on their behalf. These arrangements will play an important role in defining the allocation of risks, costs, and benefits across participants.

[29] See ACER (2022) ACER submitted the framework guideline on demand response to the European Commission – first step towards binding EU rules.

Different types of measures can be introduced to enhance long-term contracting, reflected through different types of long-term contracts at the core of the new market model and potentially cumulated. We have grouped recommendations for the investment framework around the following themes, which should be considered as complementary:

1. Framework to guarantee security of supply: Capacity mechanisms
2. Private framework for RES and low-carbon investment usually called Power Purchase Agreements (PPAs)
3. Public framework for RES and low-carbon investment
4. Facilitating hedging through the improvement of forward markets

Forward hedging, PPAs, public RES and low-carbon schemes, and capacity mechanisms, all have a role to play in de-risking investments, mitigating exposure to short-term volatility for consumers and ensuring the security of supply. If well designed, these instruments present different but complementary purposes that could be adapted to a wide range of needs and preferences of customers. Those tools should be voluntary and well-designed, and a coherent/holistic approach should be ensured as part of the reform to maintain competition, encourage market liquidity, and deliver the right long-term investment signals.

Framework to guarantee security of supply: Capacity mechanisms

Today, power markets in the EU are based on the Energy-Only market design model where day ahead marginal pricing ensures efficient dispatch and contributes (to some extent) to providing investment signals. In the future, due to significant increases of non-dispatchable generation with low variable costs, firm and flexible capacities will become increasingly valuable, especially during stress events. Many countries already have deemed it necessary to introduce capacity mechanisms to provide the desired level of security of supply and to support investment to do so. Targeted support schemes are also considered or implemented on storage and demand-side response.

These mechanisms are heterogeneous across Europe, but most involve some form of long-term contracts. State aid approval is required for the introduction of capacity mechanisms: it aims to ensure these mechanisms are proportionate to their goal in terms of security of supply, but the current state aid framework can also create uncertainty on capacity mechanisms stability. Moreover, current legislation defines them as temporary additions to the energy-only market model and as a last-resort measure to address security of supply concerns.

To ensure adequacy and security of supply, capacity mechanisms could be a core part of the market design. Member States should be able to freely choose whether to implement capacity mechanisms, and the process of approval should be smoother than today (Recommendations 1.8 and 1.9).

General provisions

1.8 Recommendation: **Structurally embed Capacity Mechanisms in the market design through a change in EU legislation and regulations to streamline and automate the approval process** if design requirements are met. EU member states could decide whether to implement capacity mechanisms.

1.9 Recommendation: **Structurally embed Capacity Mechanisms (CMs) in the market design through the modification of EU legislation and regulations which set their last-resort and temporary character.** As CMs would be an integrated part of the market design, they should no longer be seen as a last resort and temporary solution, which may deter investments to ensure adequacy and security of supply.

Capacity Mechanism design

Simplifying procedures for a more systematic ex-ante approval of CMs would incorporate these mechanisms directly into the market design. To do so, the approval process should be based on pre-defined guidelines (Recommendation 1.10). Building on current principles defined in EU regulations, these guidelines would further harmonise the key aspects of CMs to foster a level-playing field in the internal electricity market, as well as facilitate cross-border participation.

1.10 **Recommendation: Develop guidelines to foster harmonisation of capacity mechanisms and simplify the approval process, while keeping sufficient flexibility to address national adequacy needs and specificities.** In particular:

- **Specify measures to ensure that these mechanisms are competitive, market-wide, and technologically open**, remunerating all – existing and new – capacities (including DSR and storage) based on their respective contribution to system needs.[30]
- **Provide for long-term contracts** to be awarded as the outcome of the capacity mechanisms, to new-built plants, DSR or storage, or for major refurbishment works of existing plants. Different standard duration of the long-term contracts could be accessible based on objective and technology-neutral criteria such as the level of investments and other relevant costs.
- **Specify measures to ensure that these mechanisms should have an efficient interface with energy markets.** Their rules should avoid distorting energy markets, such as with eligibility criteria or activation rules. For instance, remuneration based on availability rather than actual generation would avoid distortions. In addition, the design could integrate features to hedge consumers against price spikes, e.g., through reliability options. However, modalities of implementation should be carefully analysed as they may not be adapted to all technologies, particularly storage.

Mechanisms to ensure adequate system needs

As the security of supply issue becomes more complex with growing shares of variable generation, the system needs will no longer be one dimension and focussed on capacity adequacy. Ensuring adequate investment in firm and flexible technologies will be necessary to maintain security of supply. If the system needs assessment identifies additional needs for flexible capacities, such as ramping constraints or inertia, which would unlikely be covered, adequate procurement procedures may need to be established (Recommendation 1.11). To do so, next generation capacity mechanisms could evolve to ensure availability of sufficient firm and flexible resources beyond short-term balancing reserves' procurement.

1.11 **Recommendation: Consider the introduction of a procurement mechanism allowing long-term contracting for flexible resources to ensure adequate supply of the different system needs (linked to flexibility)** if there would be a risk that such needs would not be met. This would not replace the procurement of short-term operational reserves that currently values the flexibility of resources for

[30] In specific situations where no new investments are needed but existing resources about to close could solve very rare occurrences of adequacy issue, strategic reserves mechanisms may be an option to consider.

quick adjustments of generation/consumption levels, but would aim to guarantee that available resources are technically able to provide all system needs. Such mechanisms could be further analysed to complement the traditional capacity mechanisms and could either be separate or combined into a multi-product 'capability mechanism'. In such a case, they should be technologically open.

Private framework for RES and low-carbon investment: Power Purchase Agreements (PPAs)

Over the past two decades, the growth in renewables has been driven by support policies, largely 'out-of-market' contracts with a public counterparty.

As the costs of these technologies reduced, they have become more cost competitive. Public support for these technologies can gradually be phased down as market-driven investments, often underpinned by private contracts, develop and contribute to meeting policy objectives.

The framework for RES and low-carbon investment should allow investors to choose or combine whether to enter public de-risking contracts - if they exist - to enter private power purchase agreements or other forms of private contracts, or to participate in the electricity market directly. As mentioned before, all these contracting approaches may contribute to investments and can be complementary if well designed.

However, there is currently a range of legal/ regulatory, informational, and economic barriers for the broader uptake of corporate PPAs. As noted by the Commission, the 2019 Electricity Market Directive, the Electricity Market Regulation and the Renewable Energy Directive already address a number of regulatory and policy barriers previously identified. However, these measures are not always implemented in all member states and legal barriers may remain.

Credit worthiness is a major barrier across most sectors, particularly in heavy industry and manufacturing, as well as in less developed European economies, where many organisations have appropriate energy footprint for PPAs but are not rated by any major credit rating agency. The complexity of negotiating PPAs acts as a barrier which slows entry into the market by less sophisticated off-takers.

There is a lack of long-term hedging products to address imbalance costs, or counterparty defaults with PPAs. There is therefore a risk which could deter entering into such agreements. To mitigate risks, there is a lack of possibilities to trade PPA contracts on a secondary market.

Further, in its 2019 survey, the Commission noted limited awareness and interest to sign PPAs, especially for SMEs. Furthermore, characteristics such as long tenures and fixed pricing may have reduced attractiveness for potential off-takers as they can impact their ratings negatively.

As a first step, we recommend removing barriers to PPAs, mitigating the risks associated with these contracts, and improving transparency and standardisation across Europe. Further measures could also be considered to actively drive demand in the PPA market.

Removing barriers to PPAs

Lifting any remaining barriers to PPAs is a 'no-regret' action to strengthen long-term contracting in the current market design. These barriers often stem from national legislations (Recommendation 1.12).

1.12 **Recommendation: Mandate Member States through EU legislation to remove all unjustified barriers to PPAs.**

Counterparty risk is a barrier to PPAs, as the risk that one of the parties defaults could deter entering into such agreements in the first place. This is particularly true given the long duration of PPA contracts. To stimulate PPAs, Member States could decide to take on (some of) this risk for market participants through insurance mechanisms or public guarantees (Recommendation 1.13). This could be done to drive PPAs for certain categories of users, such as large electro-intensive industrial customers, but could go further and extend to smaller players and suppliers.

1.13 **Recommendation: Introduce a framework for Member States to implement insurance mechanisms or public guarantees for counterparty risks in PPAs.** Should Member States decide to introduce such measures, different options could be envisaged, potentially subject to State aid approval. As is already in place in Spain and Norway, Member States could establish insurance mechanisms or provide public guarantees that consumers could request when signing PPAs across Europe.

- Insurance mechanisms or public guarantees could be provided to smaller parties, retailers or consortia of smaller buyers, to broaden the off-taker base of PPAs, and/or to large consumers.
- An insurance mechanism could be introduced, for instance through the voluntary platform envisaged in Recommendation 1.19. Alternatively, Public funds could offer guarantees to (i) generators, protecting them against an off-taker default, and (ii) the banks or other lenders securing repayment of loans taken out to prepay part of the PPA.
- ,These guarantees have a cost, however, as the public entity is undertaking a risk on behalf of generators and/or lenders.
- If such insurance mechanisms or public guarantees were offered, this would need to be done in a way that minimises competitive distortions. As the market matures further, the need of a public guarantee may be reconsidered.

Another barrier is the reporting accounting obligation for financial PPAs in the EU (Recommendation1.14*)*. Under EU standards, financial PPAs are required to be reported as derivatives that are revalued according to the market. Such revaluation can lead to movements in profit and loss statement for energy intensive companies. In the US, Generally Accepted Accounting Principles (GAAP) reporting rules are simpler and financial PPAs are more popular.

1.14 **Recommendation: Analyse accounting obligations on PPAs to make sure these are not a barrier for companies to enter PPAs, simplify reporting for financial PPAs** and provide guidance to companies on their reporting. This could reduce barriers to financial PPAs, which have the advantage of not taking out of organised power markets (e.g., the day-ahead market).

Smaller players still face barriers to sign PPAs and, in some countries, public purchase rules may prevent public entities from engaging in long-term PPAs for their own electricity consumption (Recommendation 1.15*)*. Moreover, these parties may not be allowed or may face difficulties to pool together and sign joint PPAs through a consortium – such as transaction costs and higher counterparty risks due to the higher number of counterparties (Recommendation 1.16).

1.15 **Recommendation: Allow all consumers to sign long-term PPAs**, including smaller consumers or public consumers, and remove legal constraints preventing them to enter such contracts.

1.16 **Recommendation: Ensure solidarity consortia to contract PPAs on behalf of multiple smaller sites/ buyers and the mutualisation of PPA risks are allowed.** With a multi-buyer PPAs through corporate consortia, the consortium could sign PPAs on behalf of numerous sites/consumers (that would not be able individually to negotiate PPAs) and would be jointly responsible for the contract. As a result, it could include a solidarity mechanism in case one of the buyers defaults. In addition, these arrangements reduce the counterparty risk for developers through the diversification of buyers. To do so, standard PPA contracts adapted to consortia could be elaborated. This could even be considered for the purpose of collective self-generation models.

When consumers or suppliers contract PPAs, they contribute to financing the development of RES and low-carbon technologies. However, in their electricity bill, they may also pay charges and levies aimed at financing the development of RES and low-carbon technologies on the same volumes. This may act as an economic barrier to the development of PPAs (Recommendation 1.17).

1.17 **Recommendation: Consider removing charges and levies related to policy costs to finance the development of RES and low-carbon technologies on the volumes of electricity acquired by consumers through PPAs (physical or financial)** with RES and low-carbon generators. This would level the playing field between PPAs and public de-risking schemes. The right preconditions need to be defined to ensure that the concerned PPAs are not only complementary to public de-risking schemes for a given asset, but fully contribute to its financing.

Improving transparency

Beyond removing barriers to PPAs, increasing the transparency of PPA information would help market participants when signing new contracts. Transparency requirements could be set on PPA signatories benefiting from support for PPAs, such as public guarantees, as to not discourage their uptake (Recommendation 1.18).

1.18 **Recommendation: Condition the attribution of public guarantees for PPAs to transparency requirements** on price, volume types, and key characteristics involved. Increasing information transparency of PPAs would help market participants develop new PPAs by acting as a reference model. This information could be provided to the regulators and published in an aggregated form on the pan-European voluntary platform developed as part of Recommendation 1.19.

Supporting standardisation

The standardisation of PPA contracts and product profiles would have a dual effect, both lowering the transaction costs across contracting parties and enabling secondary trading of contracts during their lifetime. The latter would reduce the risks of signing such long-term contracts, as they could be resold more easily should the situation of one of the parties change.

Creating standard contracts and an exchange platform for PPAs would be the first steps in lowering transaction costs with ready-made contractual agreements and liquidity pooling (Recommendations 1.19 and 1.20*)*. Yet, the creation of standard contracts or voluntary platforms with standard contracts do not guarantee their use. To create the necessary conditions for secondary trading opportunities limiting the risks faced, standardisation of contracts could be directly incentivised (Recommendation 1.20).

1.19 **Recommendation: Establish a pan-European voluntary platform to facilitate PPA trading**. The interest of such a platform could be confirmed through a more detailed assessment and the consultation of the market. The platform would first facilitate supply and demand to meet more easily.

This platform would provide standard contractual arrangements for PPAs, to facilitate secondary trading over the lifetime of such contracts if necessary. This arrangement would also allow the platform operator to act as a central counterparty to PPA contracts, potentially backed by public guarantees (see Recommendation 1.18). The voluntary nature of this platform would still allow for bespoke contractual arrangements outside of the platform if required by some market participants.

1.20 Recommendation: **Establish standardised PPA contracts and products at the EU level and promote or incentivise their use** (e.g., condition the attribution of public guarantees, streamlined approval process to participate in PPA trading platform). This could be built on existing work to develop standardised PPA contracts, like the standard EFET Corporate PPA contract.[31] EU Guidelines could set out some of the principles guiding the drafting of these contracts and the design of the products. Standardisation could also apply to the product design and profile. This would facilitate negotiation of PPAs, including for smaller or less informed consumers, as well as their secondary trading. These standard contracts must not be imposed, as they may be adapted to any situations or specific needs, but their use should be promoted and incentivised. As an example of an incentive, following Recommendation 1.18, the attribution of public guarantees could be subject to standard contractual clauses.

One of the barriers to standardisation and stronger development of PPAs is linked to the balancing/shaping risk, i.e., the risk that the actual output of the asset differs either from the standard product profile or from the consumer load profile. Given the specific shape of the output of these assets – in particular, variable RES plants – and the relatively low development of PPAs, there is no adequate product or service so far. Encouraging market participants to develop these new products or services could lift barriers for some parties to enter into such contracts as they would facilitate offering standard shaped products or balancing supply and demand with such PPAs, potentially both for generators and off-takers/ suppliers (Recommendation 1.21).

1.21 Recommendation: **Encourage entities (e.g. suppliers, generators, flexibility provides or PPA aggregators) to supply services to cover the balancing/shaping risk against remuneration** under the long term.

These entities could sell a set of standardised financial derivatives with different time horizons designed to hedge the shaping and balancing risks for typical wind or solar profiles in a given zone. To facilitate this, market operators, such as the PPA platform operator, could offer a trading place for such products and define their standard features in consultation with market participants.

These entities could also offer balancing/shaping services to the PPA parties to complement outputs to meet PPA profiles, which could be backed up by flexible resources such as storage or demand-side response. As market participants signing a PPA are still exposed to balancing/shaping risks, this recommendation aims to encourage market parties to offer and potentially to standardise hedging instruments and balancing/shaping services, and reduce transaction costs.

Stimulating demand and supply in the PPA market

In addition, more direct measures could be implemented to drive demand and supply for PPAs. To do so, there is a range of potential measures that should be left to the discretion of Member States. For instance, to stimulate liquidity on the demand side, public entities could contract part of their electricity consumption through PPAs (Recommendation 1.22).

[31] EFET (2019) CPPA Standard.

1.22 **Recommendation: Envisage using public entities as an example, by contracting part of their electricity consumption through PPAs.** Member States could decide to impose a minimum level of PPA supply for the public sector's consumption. As a large consumer, procuring electricity for public sector use through PPAs would stimulate demand for such contracts with renewables. Developing government contracts can also improve the standardisation of PPAs by setting reference contracts for public sector demand and beyond.

Public framework for RES and low-carbon investment

There is currently a wide variety of support schemes implemented in Member States. To meet the increased renewable energy targets at the lowest costs for society, and considering the cost reduction of these technologies, RES support schemes are evolving into contracting schemes to de-risk investment in RES and low-carbon technologies.

As explained in the previous subsection, contracting schemes may develop between private parties without public support through PPAs, provided barriers are lifted. However, in many countries, these would coexist with public schemes. The large share of RES development is mostly based on technologies with low variable costs, as well as variable and correlated generation. This could lead to a 'cannibalisation' effect, meaning that the development of these technologies would dampen prices at which they would be able to sell their electricity, therefore maintaining or even increasing the need for de-risking mechanisms. In such a situation, the costs of public de-risking schemes, together with grid costs, could represent a large share of the consumers' bills. The allocation of these costs and benefits should therefore be treated adequately to ensure its efficiency.

These public de-risking schemes for new assets could also bring the benefits of long-term contracting to consumers.

However, these can create market distortions for which the costs increase with the penetration of renewables. Further, the energy crisis has shown that renewable support schemes with uncapped upside revenues in the case of high prices may not be resilient and could trigger future policy interventions. This is because the perception of 'windfall profits' and need to raise money to finance consumer protection may lead Member States to intervene and create policy or regulatory uncertainty.

Therefore, the optimal designs of contracting schemes for new assets, adapted to the different considered RES and low-carbon technologies, should be identified to reduce current market distortions, and contribute to protecting consumers. The contracting framework could be based on a contract for difference design. For instance, two-sided contracts for difference[32] (CfDs) design help protect consumers and have been increasingly used across Europe. The use of these two-sided CfDs could avoid ex-post interventions of governments, especially in countries where the need to further protect consumers is likely to appear. However, these are not the only schemes that could be envisaged and could be adequate. For instance, for capital-intensive technologies with long construction times, schemes based on the definition of the remuneration of an asset base could also be considered.

[32] Contract where the buyer pays the contractual 'strike' price to the seller for the contracted volume, and the seller pays the reference index to the buyer. The reference price is typically the price on the day-ahead market and can be weighted averaged across a given period (e.g. a month) using a standard profile.

As a result, in times where the strike price exceeds the market price, the generator receives a premium and in times where the strike price is below market price, a share of the mark-up is retroceded to the buyer to reach the strike price.

Public de-risking schemes for new assets should typically be allocated through a competitive tendering process (Recommendation 1.23). Furthermore, their design principles must be adjusted to the market environment, to reduce negative impacts on short-term markets and to avoid draining liquidity from the forward markets.

Contracting approach for public de-risking schemes

1.23 **Recommendation: Allocate public de-risking contracts for new RES and low-carbon assets through a competitive process and harmonise their design across Europe**, using market-based tenders. The EU legislation should also specify that the participation in these tenders should not be mandatory to allow for market-driven investments. Exemptions from the competitive allocation process could be allowed for specific capacities for instance, such as small-scale distributed resources or in the absence of potential competition.

Guidance on best practices for the design of public de-risking contracts

A toolbox approach can be taken on the design of support schemes across Member States, to increase harmonisation of de-risking schemes across Europe while leaving freedom to Member States on their implementation (Recommendation 1.24). This would help minimise market distortions where possible and align EU countries on best practices.

1.24 **Recommendation: Develop guidance on best practices for the design of public de-risking contracts, leaving decisions on detailed design up to individual countries**. For instance, these schemes could be based on (two-sided) contracts for difference, but different options are possible for the implementation of schemes to de-risk RES and low-carbon investments. For CfDs, the design should consider the following points:

- **Product type:** Public long-term contracts can either be based on purely financial instruments or be attached to physical delivery of electricity. Financial products have the advantage of de-risking RES and low-carbon generators with less impacts on short-term operations but would require adequate clauses to ensure traceability and objective meeting.
- **Time horizon:** Contract length can differ, particularly based on (i) the technology characteristics (larger investments to be financed over longer periods may need longer contracts) and (ii) the trade-off between the market risk to be supported by consumers and investors in RES and low-carbon generation. Longer contract lengths would grant more revenue certainty to investors, but this risk is taken on by consumers for longer periods of time.
- **Counterparty:** Such schemes have typically been contracted by public entities, but alternatives are possible in the specific design (public company, etc.). **The cost and benefit allocation would also be a key component of the consumer framework**, as it could play a role in protecting consumers by bringing benefits of stable costs of RES and low-carbon assets more directly to them.
- **Reference market(s):** Where relevant, define reference markets in order not to distort the hedging strategy or impede liquidity in certain market segments. For instance, public long-term contracts based on CfDs are typically referenced on day-ahead market prices[33], but this may affect the liquidity in forward markets, especially as RES share increases, because it

[33] See footnote 32.

may drive liquidity predominantly to the day-ahead market. Other reference prices are possible, including but not limited to forward markets, intraday, or even a combination of reference prices. **Including reference to forward markets in the calculation of the reference price[34] could foster liquidity in forward markets** and longer-term hedging for these energy sources. However, it would increase market risks for investors, because of the difference between the expected production profiles and the products traded in forward markets.

- **Energy profile:** These contracts may remunerate physical electricity generation, production capability, and/or be based on standard production profiles. For CfDs, using standard production profiles sets incentives for producers to be available in times of physical shortness/high prices, but could also shield the producer against the volume risk linked to the possibility of not being dispatched (e.g., due to congestion). The contract could also cover only a set percentage of the production of an asset, allowing asset owners to choose a share up to a set limit, and have suspension clauses for temporary periods, such as in times of negative prices. This could provide better improved incentives for efficient dispatch as well as to balance between public and private contracts.
- **Technological specificity:** Beyond contract length, different contract types could be defined to match the contract features more closely to each technology's characteristics. Two-way CfDs are most relevant for variable RES and low-carbon technologies, while dispatchable RES and low-carbon technologies (e.g., based on green/ synthetic gases or storage) may require adapted schemes to ensure adequate short-term incentives.
- **Efficient system incentives:** These contracts should include provisions to ensure efficient dispatch incentives in the contract design – for instance by avoiding incentives to produce at times of negative prices.
- **Contractual conditions, including termination conditions:** The implementation of such schemes should go through a proper contracting framework to secure its application for parties. The rules regarding the termination conditions of parties to the contracts should be defined in advance and could be based on Commission recommendations, in order to avoid ex-post modifications by Member States as this would increase regulatory risks for investors.

Options for the allocation of the costs and benefits of the long-term public contracting schemes

In case of public de-risking schemes with RES and low-carbon producers, different solutions are possible to redistribute the costs (and benefits in case of e.g., two-sided CfDs) to consumers.

To do so, there are key dimensions to consider:

i. The impact on consumer price signals: the allocation of costs and benefits of public de-risking schemes could have an impact on competitiveness, electrification, and energy efficiency decisions or purchasing power. It should complement the energy price component of consumers' bills, and as such, it may affect price signals. Moreover, in case of costs and benefits, their allocation could act, to a certain extent, as a price stabiliser and contribute to protecting consumers from periods of high prices, if the allocation is well-designed. However, if applied to flexible load such as storage assets or some flexible loads

[34] The reference price could be, for instance, set at the weighted average price of forward market indices and day-ahead market price.

in demand, it may reduce incentives for them to optimise their consumption/flexibility as price spreads between peak and off-peak may be reduced.

ii. The risk allocation and the impact on suppliers: the definition of the counterparty(ies) and the allocation of costs and benefits of public de-risking schemes may create additional uncertainties and risks for suppliers, which would in turn negatively impact consumers. It is therefore important to ensure public de-risking schemes do not create unnecessary burdens or risks for suppliers.

iii. The interplay with the retail market and the dynamics of retail competition: more generally, these schemes should be designed to avoid negative interferences with the retail market and creating distortions between competitors.

To address these key dimensions, the framework for public de-risking schemes should consider how to organise transfers between parties and, more specifically, the counterparty(ies) to long-term contracts (Recommendation 1.25).

Then, the design of the mechanism will be key to provide the right incentives and allocate risks efficiently (Recommendation 1.26).

1.25 Recommendation: **Assess which options for counterparty(ies) in the application of the long-term public contracting schemes** would be the most suitable, considering in particular their impacts on price signals and incentives for consumers, the fair allocation of risks and the impacts on suppliers and the interplay with the retail market. Several options are possible to design the implementation of these schemes, which all present advantages and disadvantages. The list below is not exhaustive and does not include the many different solutions Member States have in addition to electricity market regulation when it comes to financing public measures and decisions. Some examples are, however, listed to illustrate some of the possible options:

1. **Long-term contract carried out** on behalf of consumers, **with costs and benefits allocated** either across all consumers or to a subset **through levies or charges embedded in grid tariffs.**

   This solution would alleviate some of the risks linked to the switching of consumers across suppliers, since costs and benefits can be attributed to consumers based on their actual load – independent of their suppliers. However, the costs and benefits should be allocated at sufficiently granular intervals, to avoid fiscal issues and inefficiencies with lagged payments. Moreover, if not done properly, this allocation could dampen price signals. The design of the levy structure can be a complex task. It should not distort the ratio between peak and off-peak prices or the incentives to consume in off-peak periods when there is abundant RES and low-carbon generation.

2. **Long-term de-risking schemes carried out on behalf of consumers, with costs and benefits allocated through suppliers.** The costs or benefits generated by the contract in a given period[35] could be distributed across suppliers, for instance proportionally to their customers' load during that period. The suppliers would then pass on the costs or benefits to their consumers.

   Like the previous option, this solution would alleviate some of the risks linked to the switching of consumers across suppliers. Moreover, suppliers would be able to combine these costs and benefits with the rest of their sourcing costs in a dynamic way to provide more efficient price signals through their price offers to consumers. However, it may create uncertainty on the costs

[35] A shorter period, e.g. hourly and daily, would improve cost-reflectivity.

and benefits to recover and on the balancing of the suppliers' portfolio. Further, costs may be allocated to consumers with less price-elastic demand and raise concerns regarding the fairness of allocation.

3. **Resale to suppliers/consumers via centralised auctions of long-term contract slices.** Suppliers/consumers would be able to access medium-term contracts (1-3 years for example), through voluntary, open, and competitive auctions organised by a central public or private entity. This central entity would source this electricity by acting as counterparty to long-term contracts with RES and low-carbon sources through tenders. These long-term contracts would then be broken down into shorter contracts and auctioned to the suppliers or consumers.

   Compared to the previous model, this option reduces the supplier risk exposure with long-term contracts and would level the playing field. The shorter contract terms are indeed more closely aligned with the contractual terms on the retail market, and so suppliers can better align their electricity sourcing.

   Consequently, a share of the risk is transferred to the central entity having entered the long-term contracts, as the revenues from these auctions may not correspond to the payments towards the RES and low-carbon generators under these contracts.

   Voluntary participation in the competitive auctions could also create an additional risk that the volumes contracted on the long-term are not bought by suppliers/consumers – for example at times where expected short-term market prices are lower than expected auction prices.

   There is a range of options depending on the risks left to the central entity. The central entity could bear some risks and be incentivised to organise the resale to suppliers/consumers in the most efficient way. Or the allocation process could be strongly regulated, and the central entity would bear no/very limited risks. At least to a certain extent depending on the mandate and risks left to the central entity, some of these risks would eventually befall consumers and the residual costs or benefits would need to be allocated e.g., to consumers through a levy or charge (cf. option 1).

   Moreover, the central entity could interfere with forward market, so its interaction with the market should be closely looked at to avoid distortions or risks regarding competition and efficiency of the forward market.

In the first option, i.e., if the allocation of the costs and benefits is through a levy or charge, a key issue would then be whether and how these costs and benefits may be redistributed to consumers, particularly in presence of consumer switching. If such costs and benefits are allocated in long intervals, then suppliers and their consumers could face risks due to the asynchronous nature of market costs and public de-risking schemes.

Moreover, if not properly designed, de-risking schemes could dampen short-term price signals to consumers, having a negative impact on the overall efficiency of the market. If consumers' prices are mostly defined based on long-term arrangements and no longer reflect the short-term variations in prices, consumers would have no or limited incentives to manage their load efficiently, e.g., by charging their electric vehicles at night rather than during peak hours. However, short-term price signals can still be sent to consumers under long-term de-risking schemes. Hedging prices do not necessarily remove the incentives for consumers to reduce their consumption in times of high prices if they are properly reflected in retail offers. It is therefore important to allocate costs and benefits in an efficient way (Recommendation 1.26).

1.26 **Recommendation:** More specifically in the case of option 1 (allocation through a levy or charge), **allocate the costs and benefits of public de-risking schemes for new investments** (for example in case of two-way contracts for differences and similar State arrangements) in a way that **contributes to hedging for consumers without increasing the risk for retailers while not preventing the development of offers with or distorting time-differentiated signals** such as time-of-use, critical peak pricing or dynamic pricing offers.

The costs and benefits of such schemes should be passed through to retailers and consumers in a proportionate and non-discriminatory way, and, as according to Recommendation 1.17, may exclude, under certain conditions, volumes sourced through PPAs.

The allocation could be proportional to the overall consumption, the consumption during tighter periods, the subscribed capacity, through a fixed component, or through a combination of these possibilities; however, all these approaches have pros and cons. For instance, an allocation proportional to the consumption could be deemed equitable but dampen price signals (reducing the ratio between peak and off-peak prices) and incentives to electrification. Conversely, a purely fixed component would limit negative impact on incentives but could raise acceptability issues, especially for smaller consumers.

Even if the allocation of the costs and benefits are based on consumption, there are a variety of available approaches to preserve the ability for suppliers to provide price signals to consumers. For example, the allocation of costs and benefits of de-risking schemes could cover a baseload consumption at hedged prices, leaving short-term signals for any deviations from these pre-agreed volumes.

Alternatively, costs and benefits could also be allocated to consumers through fixed rebates or fixed fees (over a given period, e.g., a month or a year) so that actual consumption can still exposed to short-term signals.

The allocation to consumers should be dynamic, i.e., updated on a regular basis, so that the benefits – usually linked to high prices in the market – may be distributed to consumers to balance an increase in prices due to these high prices, and vice versa. This way, consumers may benefit from stable costs of RES and low-carbon technologies.

Facilitating long-term hedging through a longer time horizon of forward markets and improved liquidity

Better liquidity is needed for the market to function efficiently and to improve risk hedging for all market participants (producers, suppliers, aggregators) in the forward market. There are currently barriers for participants to hedge on forward markets. First, the time horizon of forward markets is insufficient to support investment. There is low demand for long-term forward hedging from suppliers, due to uncertainties on their long-term consumer portfolio. As a result, forward power markets lack liquid products to hedge beyond 2-3 years – even in bidding zones with mature forward markets. Moreover, the volume of long-term transmission rights (LTTRs) allocated by TSOs for cross-border hedging is too low and their duration is limited to a year, limiting long-term hedging possibilities (Recommendation 1.28).

Also, as mentioned previously, renewables under support schemes usually have no incentive to hedge in the forward market, especially when the support they receive is linked to day-ahead prices. The design of these schemes could be adapted to provide some incentives for producers to hedge in forward markets.

Furthermore, collateral requirements are a barrier to hedging in forward markets for producers, consumers, and suppliers. Collateral requirements act as a barrier to entry for market players and reduce the overall share of hedged volumes on forward markets. There are currently restrictions as to what can be posted as collateral on exchanges (Recommendation 1.27).

Finally, regulatory interventions increase uncertainties which can affect forward market liquidity (Recommendation 1.29). They can potentially affect the spot market price and, hence, the value of the forward contracts (i.e., the Iberian Mechanism, the cap on inframarginal rents).

We first recommend removing barriers to hedging in forward markets. Measures through the consumer engagement and protection framework could also stimulate demand for long-term hedging. Market makers could also be considered to actively drive liquidity on these markets.

Removing barriers to forward market hedging

1.27 Recommendation: **Ease collateral regulations in forward markets, through a change in the EU Regulations, by widening the types of collateral accepted**, such as non-collateralised bank guarantees, or accepting underlying electricity production, customer contracts, or emissions trading scheme's permits as collateral. The Commission Delegated Regulation (EU) 2022/2311 introducing temporary emergency measures on collateral requirements is not sufficient as it helps to only alleviate the liquidity pressure of around 15% of the energy market participants. A structural and wider solution should be addressed through the ongoing European Market Infrastructure Regulation (EMIR) review process: the collateral accepted by central clearing counterparties (CCPs) for either bank guarantees, or public entity guarantees should be accessible for the wider energy clearing industry, rather than just for non-financial energy counterparties that are clearing members.

1.28 Recommendation: **Facilitate hedging opportunities across borders for forward markets,** where LTTRs are already used, through a change in EU Regulations, by:

- **Increasing long-term cross-border capacity volumes offered by TSOs** through more efficient capacity calculation[36] and adequate investment where needed.
- **Keeping the optionality of LTTRs** as it is used by market participants to properly hedge their underlying risks and exposures and hence contribute to higher liquidity. Obligations will not interest market participants and will be detrimental to forward market liquidity.
- **Allocating LTTR products with maturities** to match at least forward market product maturities, a minima introducing 3-year tenor LTTR. Longer tenors could be envisaged to enable cross-border PPAs.
- **Investigating the possibility to increase the frequency of auctions for LTTR products**. Details on the granularity of products and frequency of auctions should be carefully assessed and consulted with market participants. Any change of allocation design must be carefully assessed through cost-benefit analysis and added value proven.

[36] Note that Eurelectric considers that the added value of flow-based capacity calculation and allocation has not been sufficiently demonstrated and is hence not compliant to forward capacity allocation guideline. The implementation of flow-based capacity calculation and allocation would be valuable and contributing to better hedging possibilities only to the extent that more cross-zonal capacities being allocated, which should be the ultimate goal given the need for long-term hedging under current circumstances.

- **Facilitating secondary trading**, e.g., having power exchanges easing the exchange of LTTRs between market participants at a price agreed between them (commercial transaction).

1.29 Recommendation: **Make regulatory frameworks stable.** Regulatory uncertainty undermines investors' confidence in markets, hedging opportunities and ends in lack of investments. In this regard, revenue caps on existing inframarginal production must be ended.

Stimulating demand and supply in forward markets, including at longer horizons,

Going further, if the efforts to remove barriers to forward market hedging and facilitate cross-border hedging are not sufficient and there are still hurdles to hedging in the long-term (up to 7-10 years), more direct actions may need to be undertaken to improve the liquidity on forward markets on an ad hoc basis (Recommendation 1.30).

1.30 Recommendation: **Explore voluntary mechanisms for market makers in forward markets to stimulate liquidity up to 7-10 years.** These market making services should be contracted through a market-based process with voluntary participation. The selected entity performing the market making function would have the obligation to post a minimum volume of buy and sell orders for selected standard products, with a maximum bid-ask spread to increase liquidity. In exchange for this service, the market maker would be remunerated with a competitively set fee through the tender for the attribution of its function, for instance charged through network tariffs. The implementation practicalities should however be carefully analysed.

Pillar III: A framework to coordinate the future system needs

Introduction

The fast decarbonisation of the power system raises new challenges for its continued safe operation. Timely development of sources of flexible and firm power will be needed alongside the growth of renewables. At the same time, new opportunities will emerge both on the supply side with new storage technologies and on the demand side with new flexible loads from the electrification of the transport, industry, and buildings sectors.

An enhanced framework for assessing, in a forward looking way, the evolution of system needs in terms of firm and flexible resources is necessary to provide visibility for market participants and network operators. In particular, it might be useful to improve the planning approach for network investment, moving away from an incremental reinforcement of the grid to allow network operators to anticipate investments and to dimension the network to be fit for the future power system, while incorporating the use of flexibility.

We propose to enhance the existing system planning framework along three main aspects:

- Expanding the scope of system needs assessment to have a 'whole system' perspective
- Improving the current methodologies used in system needs assessment
- Reviewing the governance arrangements to conduct the system needs assessment

We detail our recommendations below.

Scope of the system needs assessment

Currently, Member States develop high-level national energy and climate plans (NECPs) to address energy efficiency, renewable development, greenhouse gas emissions reductions, interconnections, and research and innovation.[37] These plans should cover both the medium- (10 years) and the long-term (30 years). They are assessed at EU level by the European Commission to establish whether they are sufficient for the collective achievement of the Energy Union objectives.

Based on the NECPs, different forward looking EU power system studies (TYNDP, ERAA) are carried out. They focus primarily on (i) electricity network expansion or (ii) capacity adequacy. These studies therefore have a narrow focus covering only partially the different system needs, such as flexibility (long- or short-term) or system stability. They may lack more detailed information on network constraints to provide robust adequacy assessment.

Further, these studies often lack a comprehensive assessment from a whole energy system perspective (Recommendation 1.31*)*. For example, power and gas system synergies are not fully assessed in network expansion studies. In addition, demand-side contributions to the energy system, like those associated with the electrification of transport, industry and buildings, or electrolysers, are not fully captured in current studies (Recommendation 1.32).

Moreover, these studies have a different time horizon, and often do not provide a long-term perspective on the evolution of system needs. While network expansion studies have a timeframe of 20 years, adequacy studies are limited to 10 years (Recommendation 1.33*)*. The scenarios underpinning current studies extend to 2050, but they are limited to high level narratives to coordinate actions at pan-European level, and to provide information to policymakers and stakeholders to support decision-making.

1.31 Recommendation: **Widen the scope of electricity system needs assessment in EU legislation to go beyond the network expansion and capacity adequacy covered in ERAA/ TYNDP, bring more consistency, and encompass the different system needs, including network needs, adequacy and flexibility.** As a first step, develop a more granular definition of the system attributes that will be valuable in the future power system. These attributes include:

1. **Firm capacity:** or the dispatchable generation, demand-side flexibility[38], or storage to ensure adequacy between available generation and residual load at peak (after subtraction of variable generation).
2. **Flexible capacity:** or the extent to which capacities in a power system can modify their electricity production or consumption in response to variability of the system state, expected or otherwise.[39]

   To perform this system needs assessment at regional and European levels, inputs from national levels should be provided on the basis of adequate cooperation between TSOs and DSOs to encourage consistency and properly take into account distributed resources as well as system-relevant distribution networks' constraints (if any).

[37] In application of the Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action.

[38] Demand-side flexibility can be explicit (i.e. responding to specific activations) or implicit (i.e. responding to price signals) and can provide both capacity at peak (firm) and flexibility.

[39] To illustrate, this includes for instance the ability to ramp up or down to follow the evolution of the residual load, especially in systems with high photovoltaic capacities.

Moreover, this assessment should be sufficiently detailed, for instance, considering possible restrictions or outages on cross-zonal interconnections, congestions, etc. Otherwise, national assessments will need to provide a higher level of detail, risking inconsistencies and inefficient coordination at EU level.

Lastly, the system needs assessment should not be too bottom-up driven or too incremental and should consider the possibility and the relevance to develop an EU overlay grid (or a 'supergrid')and to anticipate investments in networks and optimise their dimensioning taking into account the long-term needs.

1.32 **Recommendation: Include a cross-sector assessment in long-term system needs assessment,** including the potential consumption and flexibility contributions of the industrial, buildings and transport sectors that electrify, as well as the development of hydrogen, and more broadly, of renewable and low-carbon gases.

1.33 **Recommendation: Extend the time horizon of system needs assessment** to a timeframe aligned with decarbonisation objectives, reflecting the key policy targets and milestones such as 2040 and 2050.

Methodology for the system needs assessment

In addition to widening the scope of system needs assessments, the current methodologies need to be enhanced to reflect the evolution of the power system operational challenges. These improvements to the methodology for the system needs assessment require an EU harmonised approach at principle-level, underpinned by EU guidelines (Recommendations1.34, 1.35 and 1.36).

1.34 **Recommendation: Develop EU-wide guidelines for the methodology on EU-wide, regional, and national system needs assessment,** in line with the system needs assessment recommendations in this section (Recommendations 1.1-1.3 and 1.5-1.6). These harmonised principles would differentiate the types of system needs but should leave room to ensure that a system needs assessment at national level can be specific enough to cover all potential issues and needs at that level and to assess specific local needs through TSO/ DSO cooperation.

1.35 **Recommendation: Assess systematically the economic viability for the different types of resources in the system needs assessment**. This could be based on an enhanced ERAA Economic Viability Assessment (EVA) methodology. This includes:

- **The enhancement of the current methodology:** inclusion of the effects of climate change in the climate years used in the ERAA[40], expansion to include key technologies of the energy transitions, such as batteries, hydro plants, electrolysers, and demand response, as well as the estimation and integration of potential revenues across the (economic) lifetime of the relevant assets.
- **The application of the EVA methodology to cover other system needs, while ensuring the robustness, quality, and relevance of the EVA analysis** (cf. computation time constraints): ideally, the EVA shall also need to ensure the viability of resources to meet wider system needs beyond adequacy. The economic viability should also be assessed taking into account all sources of revenues, as providing system services also provides other sources

[40] Climate change is expected to have an impact on power systems, on both the supply and demand of electricity, as well as on adequacy (e.g., on demand, wind/ solar generation, hydro stocks…). Currently, only historical climate data are considered for ERAA simulations. See ENTSO-E (2022) European Resource Adequacy Assessment, Annex 2 – Methodology.

of income to energy resources. This aligns with the wider definition of system needs in Recommendation 1.31.

1.36 **Recommendation: Stress test the resilience of the energy system through an enhanced analysis of extreme events in the system needs assessment**. For instance, testing the impacts of specific extreme climate events or of structural assumptions (e.g., expected availability of firm capacities) on the system would help complement methodologies measuring the likelihood of extreme events occurring.

Governance

Currently, system needs assessments are conducted relatively in-silo across gas and electricity. In 2020, ENTSO-E developed a new, multi-sectoral planning support (MSPS) concept and a roadmap for the evolution of the TYNDP as a tool to progressively deliver infrastructure planning using a holistic approach and multi-sectorial framework. According to ENTSO-E's implementation roadmap, the methodology would be structured by a legal framework and would be implemented by 2028, which could be too late given the investment needs to deliver by that point. Regarding the ERAA, no specific coordination across sectors is implemented beyond stakeholders' consultation.

TSO-DSO coordination is key for an integrated assessment of system needs at the local and national level. Indeed, the growth of distributed RES generation and development of local energy initiatives have a major impact at a system-scale level and raise new opportunities and new system needs. Yet, coordination across distribution and transmission is still limited for system planning, including at EU level. Governance schemes should be developed to ensure consistency in TSO and DSO planning exercise and develop a mutual understanding of the development of local resources, including flexibility, to ensure efficient grid and other resources planning at both distribution and transmission levels and in a coordinated way. Given the variety of situations across Europe in terms of distribution structures, the framework should be adaptable to these diverse situations. To facilitate planning exercises at DSO level, exchanges of information and data should be implemented in both directions between TSOs and DSOs.

More generally, stakeholder involvement could improve in the governance of system needs assessment across Europe. Current processes already include stakeholder consultations and account for views across the industry. Yet, greater transparency around system needs assessment methodologies, results and data used would help industry peer-review and continuous improvement of such studies.

To address these points, current governance arrangements can be improved (Recommendation1.37).

1.37 Recommendation: **Review the governance arrangements** to conduct the system needs assessment. In particular:

- **Assign the responsibility of the development of the system needs assessment methodology** and coordination of the assessment to ENTSO-E/ENTSOG upon validation of ACER and oversight of the European Commission.
- **Define a governance framework for cross-sector system needs' assessment**, underpinned by a coordinating entity overseeing the process. As a first step, coordination can build upon the current ENTSO-E/ENTSOG cross-sector coordination. Cooperation with the entity in

charge of H2 system planning, e.g., the ENNOH[41], should be implemented to ensure consistency of planning exercises across electricity, gas and H2.

- **Ensure adequate cooperation with distribution, through cooperation with the EU DSO entity**, as DSOs should start carrying out their own prospective assessments, to ensure consistency of planning exercises and adequate assessment of decentralised resources.
- **Improve stakeholder engagement, including DSOs, as well as** in the industrial, buildings and transport sectors which electrify, **through extended stakeholder consultations and stakeholder group meetings. Improve transparency on methodologies, assumptions, and justifications**, for a better inclusion of stakeholders in the system needs assessment process. For example, a common integrated database and modelling platform could be implemented to enhance transparency of economic viability assessments.

[41] European Network of Network Operators for Hydrogen.

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