The Electricity Market Design Revision

Decarbonised Energy Security Through Energy Storage

Brussels, November 2022

Executive Summary

More than ever, energy independence, security of supply, sector integration, and decarbonisation are guiding policymakers' actions. The electricity market design needs to do justice to consumers and reap the benefits of low-cost green solutions. It is key to leave behind polluting fossil fuels, whose influence is dominating the price of electricity. Most system flexibility is currently provided by fossil gas: this has led to an insecure energy system and forced the European Union to depend on energy imports. There needs to be a change in paradigm, with the Clean Energy Package as a foundation, where energy storage becomes a critical part of the energy system.

In a general way, legislators should look into **securing new investments via long-term guarantees** while maintaining short-term dispatch based on competitive markets as at present. In particular, EASE identifies the following changes as needed to ensure a renewable-based and secure energy system:

Decarbonise capacity remuneration mechanisms:

Rethinking security of supply is essential to phase out fossil fuels and encourage home-produced renewable electricity, where energy storage provides the capacity needed to "keep the lights on". To do so, the CM carbon cap needs to be lowered to 250g of CO2 per kWh, and carbon-neutral technologies should be awarded longer contracts with higher remuneration.

Unlock storage with low-carbon system products:

Energy storage is able to provide a range of services such as black start, voltage control, reactive power, and congestion management. The new market design must ensure that these services to support the grid are procured from low-carbon sources.

Reduce curtailment and replace gas peaking plants:

In 2020, Germany curtailed 6,146 GWh of renewable electricity, enough to cover the entire electricity needs of Liechtenstein, and instead frequently relied on natural-gas turbines. Europe needs to harness energy storage to prevent thrown-away energy and strengthen its cap on renewable curtailment.

Untap long-term investment and revenue streams:

Energy storage lacks access to long-term contracts such as PPAs or (as support schemes) contracts for difference. Encouraging the use of these long-term mechanisms would enable private investments and provide guarantees for project developers, effectively giving a jump-start to the large-scale deployment of all energy storage technologies (from shorter to longer duration) across Europe.

Forward-looking system planning:

System operators should have a transparent, long-term vision for flexibility needs in Europe. Storage-only auctions to support increased flexibility should be considered to ensure future renewables can be rapidly deployed.

Establish energy storage as a new pillar of the energy system:

By defining flexibility and energy shifting abilities, energy storage can be classified as an asset category of its own: this would end discriminatory treatment such as double taxation, discriminatory grid fees, and permitting barriers.

In the following sections, these points will be discussed.

Focus: The Questions This Paper Aims to Answer

1. How can the market design reform support carbon-neutral energy security?

2. What can be done to maximise renewables' penetration?

3. What is the role of gas "peakers" in today's energy system? What can be done to replace them with greener and cheaper solutions?

4. How to attract long-term investments in energy storage?

5. How to ensure deployment of longer duration energy storage while maintaining a level-playing field?

6. How to achieve forward-looking system planning for a cost-effective energy transition?

Context: Without Reform Europe Will Fail to Meet Its Renewable Energy Obligations

~ 200 GW

energy storage needs in Europe in 2030

~ 14 GW

energy storage to be deployed every year until 2030 to meet flexibility needs

EU climate targets. The European Union is seeking to increase the current renewable energy target to 45% by 2030, with the objective to achieve climate neutrality by 2050. The European Commission recognises in REPowerEU that the rapid rollout of renewable energy sources requires new resources of flexibility.

Renewables' costly curtailment. At the same time, renewable energy across Europe is being wasted via curtailment during periods of overproduction. Storage has the potential to capture a given part of this overproduction and shift the energy to when it is most needed, providing flexibility.

Flexibility still from fossil imports. One of today's most widely used forms of flexibility is thermal fossil plants, particularly in the form of natural gas "peaker" plants. Energy storage represents a greener alternative; yet, as shown in the next chapter of this paper, gas "peakers" are dominating auctions.

The value of energy security. In the context of the Russian invasion of Ukraine, overreliance on fossil fuel imports has put the European Union in a difficult position with higher energy prices and concerns over winter preparedness. Member States are relying on new long-term contracts to diversify natural gas supply, with the risk of locking themselves into fossil fuels and hindering greener solutions.

Why energy storage. Energy storage represents a cost-effective alternative to gas "peakers", prevents renewables' curtailment, and lessens dependency from fossil fuel imports. It thus contributes to an economically efficient energy transition, while reducing the need to over-invest in renewables.

The energy market today. The electricity market design has managed to unlock, to a certain extent, flexibility in the short-term balancing markets. However, several services for the grid are still not remunerated. Access to the forward market is currently impeded by a lack of adequate hedging instruments and missing long-term financial market tools.

If nothing changes. The EASE paper "Energy Storage Targets 2030 and 2050" assesses that, to meet European Union's climate targets, approximately 200 GW of energy storage by 2030 and 600 GW by 2050 are needed. Yet, market forecasts (e.g. LCP Delta, IHS/S&P Global) for 2030 show that only around 100 GW of energy storage will be deployed. Without an effective market design and strong long-term investment signals, the Union will not meet its decarbonisation targets; it will not be able to integrate further renewables; and it will suffer from continued security of supply issues.

A new market design and paradigm. A market design based on the energy-only paradigm has reached its limits when it comes to ensuring deep decarbonisation and security of supply. Long-term mechanisms should thus be developed to bring about sufficient visibility for investors, lower capital costs (and ultimately total generation costs) and ensure that decarbonisation targets are met. The practical implementation and design of such mechanisms (such as contracts for difference, specific auctions) can be discussed based on the identification of systems needs and definition of the associated planning progress. **Importantly, long-term mechanisms would (1) continue to rely on competitive forces in order to bring down costs and (2) work alongside and be articulated with short-term markets which shall continue to carry out dispatch operations cost-effectively as at present.**

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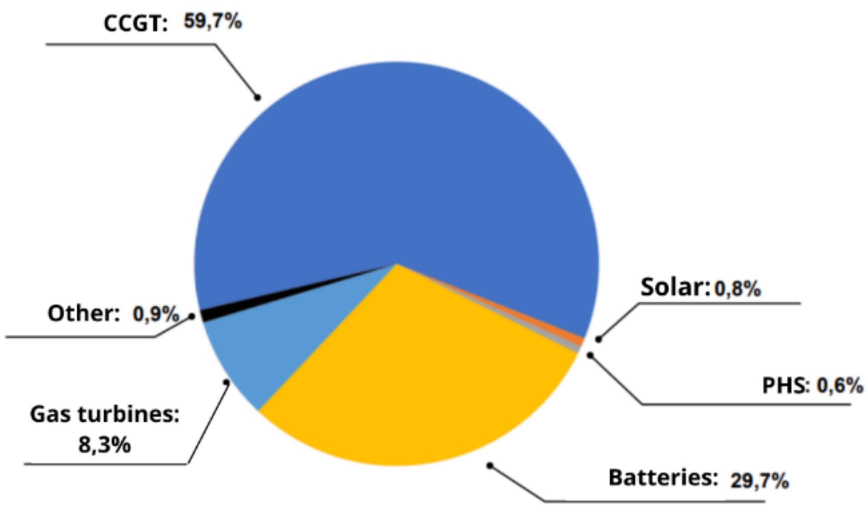
1. Align Capacity Mechanisms to Climate Targets to Bolster Energy Security

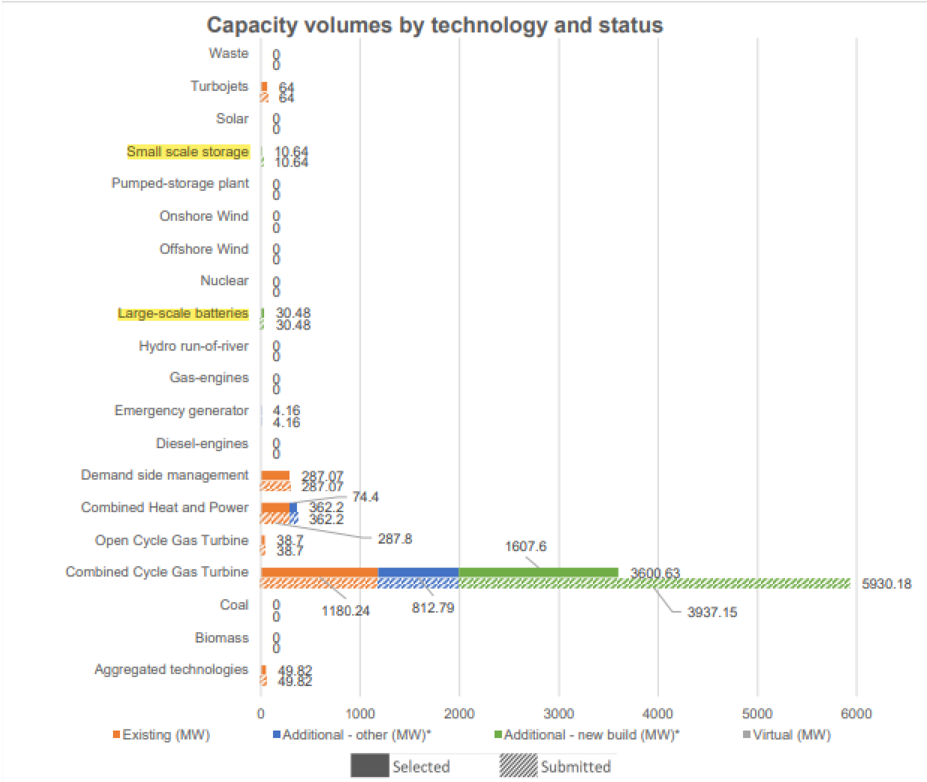
In order to ensure resource adequacy is aligned with the newest technologies and decarbonisation needs, the Clean Energy Package officially opened capacity markets' auctions to energy storage. Currently, EU-level capacity mechanisms have to be technology neutral, with the only caveat of a 550 g/kWh emission cap that prevents coal plants from entering the auctions.

While this was a needed and long-awaited step forward at the time, the ambition for carbon-neutral capacity mechanisms has to rise further. Gas "peakers" (e.g. Combined Close Gas Turbine plants - CCGT) still win the overwhelming majority of capacity auctions across Europe. Data from e.g. Italy, Belgium, or Poland clearly show that low-carbon and carbon-neutral solutions, while already technically able to provide needed services, are still far from being the preferred choice in terms of security of supply. As per the graph below, batteries were able to win one third of the Italian capacity auction for 2024.



Source: Terna Capacity Auction results for 2024. Energy storage systems are already competitive and can be deployed immediately, especially in less interconnected areas – but CCGT still dominates the CRM.

Yet, it should be stressed that this is an exception and not the rule: the Belgian capacity auction awarded the majority of contracts to newly built CCGT– see table below.



Source: Elia Capacity Auction for 2025/2026 for Y-4, longer term capacity allocation. CCGT plants win the majority of CRM auctions in Belgium. The shorter-term auctions in the following years may provide a better opportunity for energy storage, however CCGT dominated.

It is important that Member States, when choosing to implement a capacity mechanism, encourage the participation of carbon-neutral technologies to reduce dependence from gas imports, contribute to decarbonisation, and ensure cost-efficiency. To do so, EASE urges policymakers to implement the following actions:

- Progressively set the carbon cap to 250 g/kWh and gradually decrease the annual cap of kg/CO2 per installed kWe, to phase out the use of fossil fuels, including imported fuels which may hamper energy security. The current rules on capacity mechanisms foresee a carbon cap of 550 g of CO2 of fossil fuel origin per kWh of electricity and an annual cap of 350 kg CO2 of fossil fuel origin per installed kWe, which was set in line with the European Investment Bank's (EIB) own energy lending policy. The EIB has since updated its carbon cap by decreasing it to 250g of CO2 per kWh, setting higher standards for European investments in energy.
    - Establish set milestones (2025, 2030, 2035, 2040) to phase out completely fossil fuel capacity providers and bring both the general (g/kWh) and annual (kg/kWe) cap to zero.
    - Ensure that Member States planning for a Capacity Mechanism in their **National Energy Climate Plans highlight how they plan to respect this new carbon cap.**
- Carbon-neutral facilities (i.e. facilities with carbon-neutral operations) should receive a favourable treatment when providing the requested capacity in compliance with the Climate, Energy and Environmental State Aid Guidelines. This would especially support innovative technologies capable of supplying firm capacity and provide a baseline remuneration in order for them to be immediately bankable.
    - **Award longer contracts** (15-20 years) to technologies below a certain CO2 limit – with longest contracts to be awarded to newly-built facilities with carbon-neutral operations.

    - **Establish a scalar approach based on carbon content for capacity payments:** higher remuneration for carbon neutral facilities (up to 200% of Capacity Mechanism clearing price) and lower remuneration for facilities that emit the maximum allowed carbon emission (down to 50% of CM clearing price).

        - **Alternatively, introduce a regulated additional premium** for carbon-neutral facilities. The calculation would include the estimated RES investment savings, a value which is not captured in the energy markets and leads to underinvesting in (e.g.) storage capacity.

    - **Allow to stack revenues:** it must be allowed to participate in other markets in the hours when no availability for the awarded capacity is requested.

- Ensure resource adequacy reports take into consideration of the amount of renewable energy that is curtailed yearly in each zone: as a principle, curtailment should be minimised, thus reducing the need for RES investments. The amount of curtailment that is cost-efficient (i.e., cost of additional flexibility, including storage, vis-à-vis RES investment cost saved) should be determined and pursued. This would allow not only to use of renewable facilities efficiently without wasting renewable electricity, but it could bring down electricity costs and supports energy security. The reports should highlight possible options to reduce the curtailment (cross-border integration, demand response, energy storage, network infrastructure) by prioritising the least carbon-intensive option.

2. Support Integration of Renewable Energy Through New Mechanisms and Market Products

Currently, European Union rules on balancing state that "contracts for balancing capacity shall not be concluded more than one day before the provision of the balancing capacity and the contracting period shall be no longer than one day" (unless a regulatory derogation is approved) [1]. While this enhances market liquidity, some energy storage facilities need secure, longer-term revenue streams to strengthen their business case and provide carbon-neutral grid services: this provision hampers that.

Moreover, exclusively referring to balancing is not reflective of the current diversity in the ancillary services markets: some TSOs and DSOs are developing innovative market products to deal with increasing renewables' penetration and more frequent grid imbalances.

In this chapter, new products to be procured by system operators will be listed. EASE believes that existing products, the ones proposed below, and future ones should be based on the following principles:

- The procurement of ancillary services should follow the general principle of pursuing the least carbon-intensive option, when technically feasible and economically viable (e.g. taking into consideration ETS CO_2 price).

- Energy storage operators should be able to sign multi-year contracts with system operators to provide a bundle of ancillary services.

    - Preferentially, these contracts could be minimum revenue contracts, establishing a price floor for the electricity that will be provided within the agreement.

[1] Electricity Market Regulation 2019/943, Article 6.

2. 1. Congestion

Congestion issues, both in the form of grid scarcity and structural congestion are still widespread, with the most common solution being renewable energy curtailment.

- In the United Kingdom, the 5 DSOs use the "Piclo Flex" platform to procure flexibility from over 300 providers, a total of over 10 GW in capacity. The Netherlands has a similar system named "GOPACS". Such platforms can be replicated in the rest of the EU. EASE recommends to:
    - Introduce congestion management platforms for DSOs – i.e. market places such as "Piclo Flex", where network operators, energy suppliers, and flexibility providers participate in trade.
    - Develop standardised flexibility service markets based on capacity payments.
    - Ensure contracts' length is at least one year, with preference for multiple year contracts.

2. 2. Fast Response

When proven necessary for system stability, EASE encourages to implement the following:

- Introduce faster Frequency Response products such as Dynamic Containment in the UK, Fast Frequency Response in Ireland, and the pilot project on Fast Reserve in Italy. These services support Frequency Containment Reserve with faster activation times, being able to provide electricity right after the event. EASE supports the following characteristics of a faster FCR:
    - **Ensure fast activation time** (down to 1 second).
    - **Establish that winning facilities must be able to provide the contracted capacity** for at least 15 minutes.
    - **Introduce the possibility to sign longer contracts** (up to 5 years); not subject to balancing contracts rules (art. 6 EMR).

2. 3. Priority dispatch

Member States shall ensure that energy storage deployed in co-located facilities with renewables follows the same priority dispatch rules in place for renewables-only facilities, as per the Electricity Market Design Regulation Art 12, (2), EMD Dir, Art 31 (4).

3. Reduce Curtailment and Replace Gas Peaking Plants

In 2020, Germany curtailed 6,146 GWh of renewable electricity, enough to cover the entire electricity needs of Liechtenstein. Most of this curtailment appears to stem from economically inefficient situations, since alternative solutions for absorbing excess renewable electricity are underdeveloped. **Member States are wasting home-grown renewable electricity, frequently only for it to be substituted by natural gas turbines,** prolonging Europe's dependence on fossil fuels imports.

TSOs are currently obligated to keep curtailment (renewable down-ward redispatch) below 5% where economically feasible, to promote renewables and flexibility markets development. Yet, it is only enforced on Member States who have below 50% renewable electricity penetration. Some Member States are already over this threshold and therefore have no limitations. In the coming years renewable electricity penetration over 50% will become the norm, curtailment will increase, and yet under the current rules the current cap will not apply. This is a missed opportunity to incentive curtailment reduction [2].

As renewables' deployment increases, the issue of curtailment will become an ever more pressing issue. Therefore, EASE recommends to:

- Provide option to Member States to set curtailment caps at over 50% renewable electricity penetration. A basic cap of 5% should remain the default under 50% penetration, with the option for Member States with over 50% renewable electricity generation to set curtailment caps in order to reach 2030 renewable energy targets. Market-based dispatch should be prioritised, though curtailment will still play an essential role in a socio-economically optimised system.

- In the case of flexible connection agreements at the DSO level, curtailment should be traded. At the distribution level, rather than equally curtailing all distributed energy resources units and paying a fixed price, units should compete to offer curtailment.

- Roll out Member State natural gas peaking replacement strategies. Each Member State should map all of its gas-powered turbines being used for peaking flexibility, both single plants, and units within larger plants, existing and proposed. Suitable methods to replace natural gas used for peakers should be identified, with energy storage being auctioned on the capacity market.

    - ·A best practice: the "Energy Storage Peaker Plant Replacement Project" campaign in the United States has mapped gas peaker plants in several states, which are prime candidates to be replaced by energy storage technology to support decarbonisation and the health of the local population. Today there are proven technologies that can capture otherwise-curtailed renewable energy and provide flexibility more efficiently than current natural gas peaker plants.

- Introduce a new category of "renewable peaker",which are designed as hybrid plants (solar-storage, wind-storage, solar-wind-storage). Each Member State should introduce regulations or incentives that allow new and/or existing renewable plants (including storage) to offer peaking power aside their original purpose. This is key to set alternative or additional revenue streams to incentivise grid-supporting assets.

[2] It is important to clarify that the aim should never to be to reduce curtailment to 0%: it plays a role in system flexibility and can provide a socially and economically sound option.

4. Enable Long-Term Investment and Revenue Streams for New Capacity and Technologies

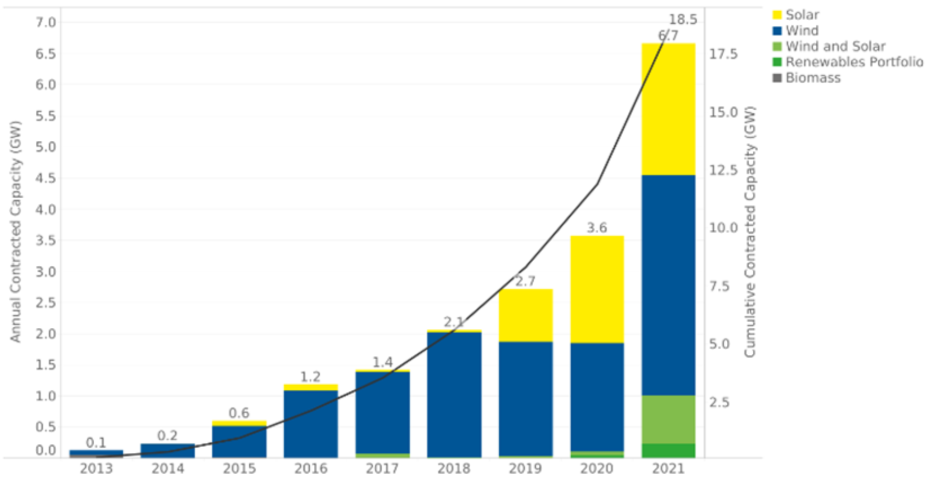
Currently, the energy storage business case relies mostly on arbitrage and providing balancing services. Yet, storage facilities can support renewable generation when it comes to the wholesale market, and can be a household/Commercial & Industrial green electricity provider. This brings added value to renewable plants (and the energy system as a whole) by ensuring a more reliable flow and reducing the amount of volatile generation.

Deep decarbonisation and security of supply can only be achieved through assets with a long lifetime and high capital costs (a.o. innovative storage technologies, co-located storage with renewables, hybrid plants). Therefore, **long-term investment planning and guarantees** are required to ensure such solutions are deployed in a cost-efficient manner. In this chapter, we discuss tools to do so.

4. 1. Hybrid Power Purchase Agreements

Power purchase agreements (PPAs) for renewable energy sources are a critical tool for deploying new RES projects as well as shielding consumers from future price volatility.

As the ACER Report on Wholesale Electricity Markets points out, long-term renewable PPAs provide long-term price signals toward clean energy technologies.



Source: PPA Anouncements 2013-2021 (GW contracted capacity); Re-Source (2021) https://resource-platform.eu/buyers-toolkit/

Between 2016-2021, more than 16 GW of new renewable energy were contracted in Europe either through corporate PPAs or direct onsite installations. Until 2018, wind accounted for 90% of the contracted capacity in Europe, but recent growth in solar PPAs has further driven market growth.

From the developers' perspective, PPAs make the project "bankable", allowing to seek out financing from capital markets, accessing a secure, long-term revenue stream that provides investment security. From the off-taker standpoint, they help major industries and electricity suppliers reach their clean electricity goals and obligations. Unfortunately, smaller consumers (SMEs, households) have limited access to tailored PPAs and therefore do not exploit the benefits outlined above.

Several economic sectors require 24/7 round-the-clock clean electricity. Relying only on renewable facilities though "pay as generated" type of contract exposes them to the risks of volatile production. This is a key issue not only for physical but also for virtual PPAs, as it can expose to financial risks when the market price fluctuates significantly. In other cases, while 24/7 clean power is not needed, RES-only do not always cover peak load hours: there is therefore a need to "enhance" the natural timeframe of the renewable facility.

Hybrid (i.e. renewables coupled with storage) PPAs are therefore emerging as a valid tool to tackle such issues. In specific cases, Hybrid PPAs may even be socio-economically preferrable to RES-only PPAs, and should therefore be incentivised. In fact, while non-renewable PPAs (especially from low-carbon sources) will still be signed in the coming decades, renewables are growing and there is a necessity to pair them with flexible assets. This does not mean that 24/7 PPAs are to be incentivised when not socio-economically preferable, but if a market failure occurs, Member States should be encouraged to set up an apt framework to untap the opportunities offered by these contracts.

EASE recommends to:

- Define the concept of 24/7 renewable energy in regulation or as industry practice: EASE supports the possibility of signing 100% renewable PPAs where each kWh is guaranteed to be consumed in the same calendar hour as it is produced/injected, validated by meter/grid data and energy attribute certificates with a time stamp of one hour or less (when possible).
    - Only with a definition of 24/7 renewable energy is possible to incentive Hybrid PPAs by fully recognising their benefits to the system, e.g. through fiscal incentives or by establishing certification systems.
- Update the existing energy certification mechanism by including time - stamping, ensuring proof of round-the-clock matchmaking between generation and consumption. This is in line with the European Parliament adopted text on the Renewable Energy Directive: "A guarantee of origin shall specify at least: [...] the start and end dates as close to real time as possible, with the objective to arrive at intervals of no more than one hour of production."
- Develop an incentive system to procure as close as 24/7 clean power as possible.
    - **Encourage long-term contracts** (10 years or more) to support projects' bankability.
        - *Best practice from Spain:* Royal Decree 1106/2020 gives large industrial consumers certain rights to ensure greater certainty over their energy costs. To access this privileged regime, these industrial electricity consumers must contract at least 10% of their annual power demand via a renewable energy CPPA (with a minimum term of five years).
- Ensure Public entities encourage RES + storage PPAs by providing temporary credit guarantees (state-backed Contracts for Difference) to develop the market for Hybrid PPAs.
- Rely on standardised frameworks and forms to lessen the administrative burdens.
- Ensure access to long-term contracts for round-the-clock renewable energy not only to industry players but to residential consumers.
        - *Best practice from Italy:* Legge 20 Maggio 2022, n. 51 incentives to install behind-the-meter batteries support the energy storage industry while making it possible for consumer to decarbonise their electricity consumption.

4. 2. Financial Instruments: (Carbon) Contracts for Difference, Cap & Floor Mechanisms

While established markets (such as balancing) may in some cases see sufficient levels of liquidity, for certain market segments and certain technologies, the market is not yet liquid enough to guarantee competition. Therefore, it is key to ensure liquidity and a level-playing field between technologies (as per the Clean Energy Package) in certain cases; and look at financial instruments when market failures arise.

When such failure is manifest in a given electricity market (e.g., NECP renewable targets are not going to be met without public support, or energy storage is not deployed at sufficient rate to support RES development), long-term contractual strategies are an important tool within the State aid framework. In this context, several Member States are starting to deploy e.g. Contracts for Difference [3] (CfDs) and Cap & Floor [4] (C&F) mechanisms to support bankability and hedge price risks. EASE suggests the following mechanisms:

- Contracts for Difference and Cap & Floor mechanisms should be deployed as they offer long-term fixed revenue signals that have the ability to increase energy market revenues while substantially reducing risk for investors.
    - **Carbon Contracts for Difference** [5] represent an alternative tool to incentives carbon-neutral facilities, with the advance of not penalising them when the market price becomes too high.
        - *Best practice from the United Kingdom*: CfDs are currently deployed in support for low-carbon electricity generation through the Low Carbon Contracts Company (LCCC), which issues the contracts and makes CfD payments, with National Grid (the British TSO) responsible for running the allocation process.
- Deploy safeguards to ensure grid-supportive behaviour from producers who benefit from CfDs. To prevent generators from injecting electricity into the grid when there is risk of congestion, safeguards (such as penalties, or a "soft cap" as an incentive) should be set.
- Make sure that co-located facilities that access these support schemes are still able to charge electricity from the grid to participate in other markets – the electricity used to charge the storage facility would not fall under the support scheme, and would be traced through a smart metering system.

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[3] Contracts for Differences are multi-year contracts that set a "strike price" for the electricity to be dispatched, allowing investors in the asset to fix a price per MWh in the electricity market. Where market prices fall below the strike price, the facility is compensated for the difference by a public body; simultaneously, the facility must return any value captured above the strike price.

[4] Cap & Floor mechanisms establish a minimum and maximum level of energy price (e.g., EUR/MWh) for the asset owner, also commonly referred to as price corridor. If the asset's energy price capture falls below the floor, it will still be paid the floor price. Similar dynamics apply to the cap, but in reverse, with a "hard" cap reflecting the highest energy price that can be secured to limit the cost exposure of the offtake company (excess revenues are returned).

[5] Carbon Contracts for Difference are an instrument investigated by the recent Climate, Environmental and Energy State Aid Guidelines (CEEAG). With a structure similar to CfDs, the mechanism would provide a payment per ton of CO_2 that is equivalent to the difference between the strike and the EU ETS carbon price.

4. 3. Forward Hedging Products

The capability to shift energy (for short period of time, and with newest technologies also longer term) has always made arbitrage one of the most easily accessible revenue streams for energy storage. Article 9 of the Electricity Market Regulation (EMR) allows market operators to develop forward hedging products, and explicitly includes renewable energy generators. To ensure a level-playing field and a clear framework across Member States, EASE suggests to:

- Include energy storage operators alongside renewable generators in art. 9 of the EMR, ensuring that they can develop forward hedging products (including long-term) at the same conditions as other players.

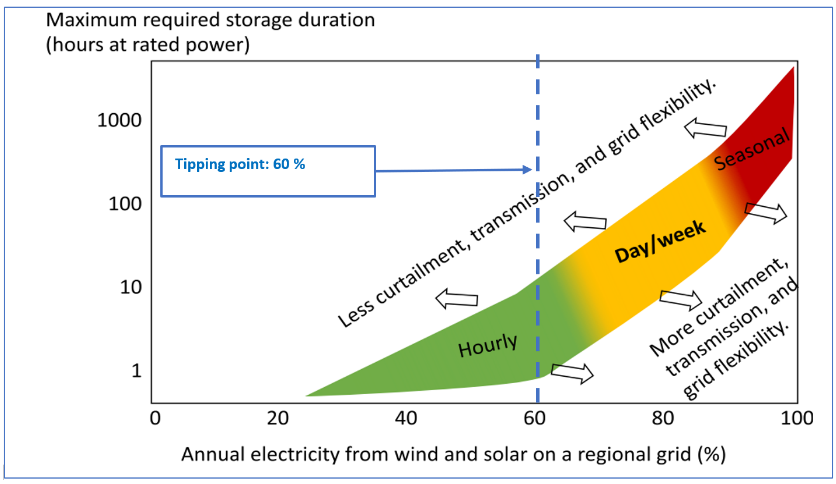
5. Unlock Longer-duration and Seasonal Energy Storage Deployment

While energy storage deployment in the European Union is significant, most of the solutions deployed focus on shorter-term energy storage. This is due to three factors that impact energy storage focusing on longer-term: uncertain revenues and costs; high upfront costs; and long lead time.

Yet, longer-duration storage is key to solve the limits of tomorrow's energy system. As renewables energy production varies significantly within the day, week, month, and year, longer duration energy storage contributes to the flexible supply of energy. It bridges the renewable supply gap and simultaneously stabilises the energy price.

Besides, the Russian invasion of Ukraine has shown that relying on gas imports for security of supply is not an acceptable policy. In this sense, longer duration energy storage represents a convincing alternative to fossil fuel strategic reserves.

Many long-duration energy storage technologies are at the early market-readiness level. Therefore, support is required for them to reach the markets where system needs will require to do so; as a general rule, value added by long-duration storage (meaning >8h output) should indeed be assessed and integrated in these considerations. As shown in the image below, as renewables' penetration in the energy mix reaches over 60% (calculated on each node), longer duration technologies are required.



Source: Adapted from Albertus et al. (2020), doi:10.1016/j.joule.2019.11.009.

The following points should be implemented to provide fair revenue streams and ensure the European Union achieves its energy security and sustainably needs:

- Establish EU, non-binding seasonal energy shifting targets and strategy. As more end-uses become electrified, e.g. heating, seasonal energy shifting needs are likely to increase. To avoid being caught off guard, the EU should work on a strategy with targets. The EU's new rules on winter gas storage, agreed upon in the context of the Russian invasion of Ukraine, set a precedent for this level of winter preparedness by storing energy throughout the year for later use.

    - **Member States should be encouraged to develop a national strategy** by assessing their needs and how to increase amounts of energy shifted from a seasonal perspective year on year. Member States should also look into the option of non-binding targets.

- Set up seasonal capacity auctions that ensure revenues streams for technologies able to store electricity from season to season, if this is identified as needed by the Member State (see previous point). Setting up dedicated, season-to-season capacity auctions allows operators using technologies storing electricity for months and beyond to better evaluate seasonal needs and bid accordingly. Moreover, including seasonal energy storage in market-based auctions will also support its commercial deployment.

- Support 24/7 PPAs for longer-duration energy storage. As discussed in the previous chapter, 24/7 PPAs enable clean power supply and enhance the energy system's flexibility by avoiding grid congestion. As longer-duration and seasonal storage technologies become more mature, 24/7 PPAs increase their bankability by securing the offtake prices and providing a secure supply of renewable electricity. On top of this, 24/7 PPAs have a substantial impact on reducing investors' risk in the operation of the seasonal energy storage business.

- Ensure support (such as CfDs and C&F pricing) for longer-duration energy storage. if such storage is specifically identified as needed (see "Establish energy shifting targets and strategy" above). Currently, many investors find the seasonal energy storage industry too risky to invest in: as discussed in the previous chapter, CfD and C&F are to tackle this barrier.

    - Any market-based or publicly-funded mechanism should be technology-neutral and awarded in a competitive process whenever possible.

6. Improve System Planning and Operation

A fundamental pre-requisite to achieve decarbonisation and security of supply is to introduce a coordinated investment planning process, and in this respect, planning has the potential to provide the needed level of dynamic coordination. This is especially true in a context where investors lack sufficient visibility about future technology mix and market conditions. In turn, this calls for a decision-making process that is robust and based on the identification of system needs. Currently, system planning has focused on the roll out of renewable energy sources, but has lacked in setting out how flexibility will be provided in the short and long-term. Market players are unable to respond to long term investment signals without transparent data and best practices.

6. 1. Enhanced Focus of System Operators

- Extend ENTSO-E vision towards a 2050 energy system. The current outlook for ENTSO-E objectives covers the period set out in the policy framework for climate and energy covering, from 2020 to 2030. Throughout its objectives, ENTSO-E should seek to look further forward. (EMD Reg, art 28)

- Expand ENTSO-E focus on covering energy storage and flexibility needs in parallel to renewable energy integration. Currently, ENTSO-E has the efficient integration of RES and energy efficiency measures as its core functions. Without an explicit focus on the need to roll out energy storage and flexibility, European decarbonisation goals will be in jeopardy. (EMD Reg, art 28), (EMD Reg, art 30 (o))

- ENTSO-E should consider seasonal energy shifting in seasonal adequacy.

- Consider the implementation of storage-only auctions, taking into account the needs already identified in the NECPs, the presumed geographical concentration of requests for connection of non-programmable renewable facilities, network developments and service needs. The auctions should be technology-neutral and provide annual remuneration for the services that the storage facility is expected to provide following the auction.

  - See Italian example of storage-only auctions, set up in Legislative Decree 8 November 2021 (Article 18).

- Regional Coordination Centres should propose non-wires alternatives to new transmission line construction. Cross-border technological solutions such as grid boosters, virtual transmission lines (VTLs), and aggregated flexibility, may be missed by TSOs only looking in their own grid areas. RCCs should investigate alternatives and suggest their use if more cost-effective, taking into consideration both CAPEX and OPEX.

6. 2. Seeking Best Practices

The new DSO Entity has the opportunity to bring a common direction to all of Europe's DSOs to help decarbonise the electricity grids.

- DSO Entity should develop best practices for integrating renewable energy, DERs (including energy storage), managing local congestion, and maximising RES usage (i.e. avoiding curtailment) (EMD Reg, art 55)

6. 3. Transparency Obligations for System Operators

The curtailment of renewable energy is felt all over Europe, with figures set to rise with the deployment of new renewable energy sources. Home-grown renewable electricity is being wasted, frequently only to be supplemented with fossil gas at a later point. The issue is hard to combat due to a lack of available data, and when available, it is difficult to compare or aggregate them due to inconsistencies with methodology and format.

- Publish figures for RES curtailment by each TSO area in real-time, with a final annual figure and a focus on specific nodes experiencing high levels of congestion-based renewable energy curtailment. Data containing redispatch and congestion costs should also be made publicly available. (EMD Reg, Art 50 (4))

6. 4. Time-dependent, Flexible Network Charges

- Introduce a time-dependent network charges mechanism that reflects the congestion in the grid and signals the scarcity of grid resources, as far as the tariff remains readable by final users and provides a relevant incentive.

6. 5. Keep the Zonal Market Pricing Mechanism for Now

Locational factors in pricing are key to a functioning energy market. This fact leads many to debate the potential benefit of introducing a nodal market pricing model, as deployed in the United States and New Zealand, rather than adhering to the current zonal market pricing model. However, **a transition to this alternative would likely put additional unneeded pressure on stakeholders at a time when consistency and certainty are paramount.** In addition, existing market failures leading to a lack of investments needed to achieve decarbonisation targets would be even greater in nodal model where energy prices would be subject to increased volatility.

7. Establish Energy Storage as a New Pillar of the Energy System

In order to avoid discriminatory treatment (such as double taxation, disproportionate grid fees) and to better address the value energy storage brings to the energy system, it is necessary to recognise its unique characteristics. In most national legal systems energy storage falls under either "generation" or "consumption", which leads to regulatory uncertainty and unreasonable barriers. It is therefore paramount to categorise it correctly – as a pillar on its own, next to "generation", "transmission", "distribution", and "consumption".

Establishing energy storage as a new, fundamental pillar of the energy system would make unbundling rules more coherent, address inconsistencies within the system, and provide investment signals to ensure reliable and sufficient energy storage is installed.

EASE recommends this is done by implementing the following:

- Establish a definition for system flexibility and energy shifting:
    - (Power) **system flexibility**: "the ability of a power system to reliably and cost-effectively manage the variability and uncertainty of demand and supply across all relevant timescales" (IEA, 2019).
        - The "ability" described can be provided by several different technologies (such as energy storage, demand response, and so on).
    - **Energy shifting:** the ability of providing (power) system flexibility by storing electricity for different durations (seconds, minutes, hours, weeks, months, seasons), and then releasing it back to the system when needed. In other words, electricity flows in two opposite directions at different times (it is therefore also called "bi-directional" system flexibility).
        - Energy storage is the only solution able to provide this specific type of system flexibility: energy shifting. This means energy storage acts as "consumer" or "generator", sometimes virtually at the same moment. Energy storage spans different existing categories and does not belong to a single one.

    - In a decarbonised energy system where significant generation imbalances exists across the year and within the day, the energy shifting ability will be paramount to a secure and reliable grid. Dispatchable power generation will come mainly from energy storage (with support from e.g. biomass and high efficient co-generation coupled with CCS), which means that these energy shifting technologies needs to be regulated in a clear way.

- Collect unbundling and rules regarding market access for energy storage under a specific section within the Electricity Market Directive, to better reflect the specificities of this technology and ensure coherence in the legislative framework.

8. Conclusions

As highlighted by the EASE paper "Energy Storage Targets 2030 and 2050", the European Union needs approximately 200 GW of energy storage in 2030 to achieve security of supply and meet the climate targets. Yet, market forecasts indicate than around 100 GW will be actually deployed.

To change this trajectory, EASE believes two things are needed: long term investment signals; and improving the energy storage economics. For the former, EASE suggests an energy storage strategy with targets. For the latter, it is key to focus on removing unreasonable barriers, ensuring non-discriminatory access to available support schemes, and improving market design.

In this paper, EASE has discussed the need for a new market design. Such design must able to support energy security, maximise renewables penetration and use, replace fossil fuels with greener alternatives, and attract new investments for innovative technologies. This must be done in a cost-effective manner to achieve a just transition and meet climate targets.

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About EASE:

The European Association for Storage of Energy (EASE) is the leading member - supported association representing organisations active across the entire energy storage value chain. EASE supports the deployment of energy storage to further the cost-effective transition to a resilient, low-carbon, and secure energy system. Together, EASE members have significant expertise across all major storage technologies and applications. This allows us to generate new ideas and policy recommendations that are essential to build a regulatory framework that is supportive of storage.

For more information please visit www.ease-storage.eu

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Disclaimer:

This response was elaborated by EASE and reflects a consolidated view of its members from an energy storage point of view. Individual EASE members may adopt different positions on certain topics from their corporate standpoint.

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