ACER
European Union Agency for the Cooperation of Energy Regulators

CEER
Council of European Energy Regulators

Challenges of the future electricity system

Recommendations and commitments

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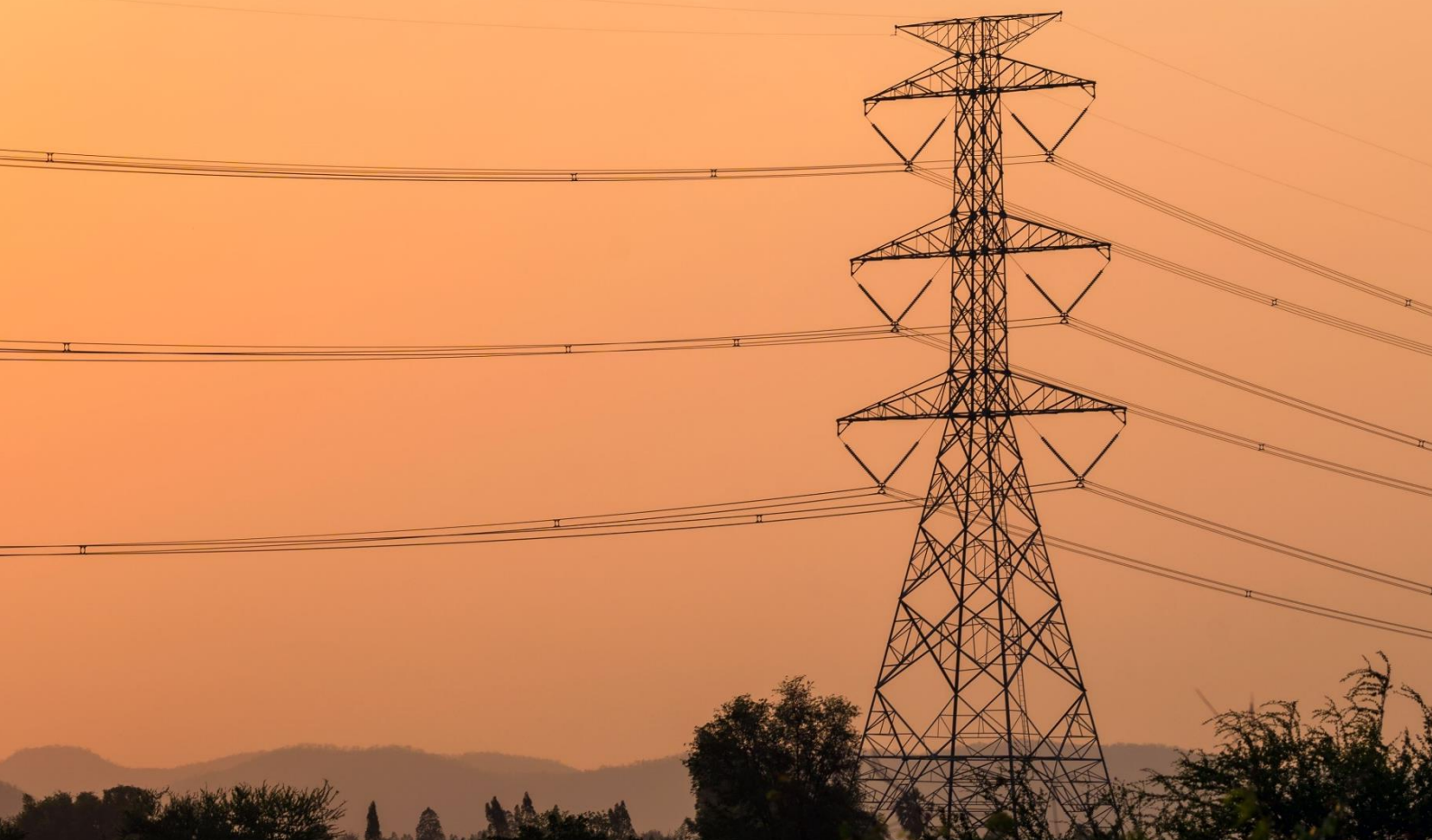

In its recent evaluation "REPowerEU – 2 years on"[1], the European Commission states that the emergency measures did not only help to manage the energy crisis, but also supported reaching the ambitious EU decarbonisation targets that run parallel to complementary objectives of energy market integration, competitiveness, security of supply and energy affordability. Collectively, these targets steer the energy system towards a transformed structure that will have a considerably larger proportion of intermittent renewable energy sources, higher electricity demand, more small-scale and decentralised generation and a significant share of flexible generation, storage and demand. Technology and business models will also evolve and support this transformation. Energy regulators aim to ensure a consumer-centric flexible, efficient, secure and robust energy system that supports the energy transition.

To enable fully this future trajectory, the legal and regulatory framework should be adapted to help remove barriers for this transformation and facilitate new businesses and innovation. While the focus should remain on implementing the existing legal framework, the upcoming challenges anticipated in the electricity system of 2030 and beyond do require some additional improvements of the legal framework. These additional challenges arising from the energy system transformation are driven mainly by decarbonisation goals achieved through the intermittent renewable energy sources, increased electrification, decentralisation, and technological evolution. In parallel to tackling the new challenges the framework should also be consolidated, integrated and streamlined.

EU energy regulators are proposing the following 16 recommendations and five commitments that will allow the EU as a whole and Member States to actively steer the transformation and harness the power of the energy transformation.

Given the time needed to develop, introduce and implement legislation, EU energy regulators call upon the European Commission, Council and Parliament to prioritise these electricity challenges throughout the legislative process in their upcoming mandate(s).

[1] REPowerEU – 2 years on, 13 May 2024.

1. Integrated security of supply with flexibility at its centre

1.1. A pan-EU approach to electricity security of supply significantly reduces decarbonisation cost

The accelerated deployment of intermittent renewables and the phasing-out of conventional fossil-fuel generation, combined with growing electrification of demand, exacerbates Europe's electricity security of supply challenges. Well-interconnected markets are key to mitigate the impact of national price shocks and enable Member States under strain to import surplus electricity from abroad or export excess generation.

The extent to which national security of supply policies consider cross-border electricity trading is vitally important. If Member States rely on imported electricity, they reduce their cost of security of supply. However, Member States may have a legitimate concern that cross-border capacity and imported electricity that they considered in their security of supply scenario is unavailable when needed. Both, interconnection capacity and foreign generation capacity, are needed to enable Member States to rely on security of supply derived from electricity imports. A joint approach requires a genuine trust among Member States that cross-border capacity will be available when needed, notably during power system stress, such as scarcity and oversupply. The legal and institutional framework (e.g. via a smarter NECP framework better coordinating investment plans to maximise complementarity of national energy mixes) can anchor this trust among Member States - for example by quickly and rigorously enforcing against deviations from the rules - and can thus deliver electricity security of supply at a lower cost across Europe.

Recommendations:

1. **European Commission to strengthen governance and institutional framework ensuring the availability of cross-border capacities, in particular in times of system stress.**
2. **ENTSO-E and Member States to better reflect the ability of Member States to support each other in times of stress in their electricity resource adequacy assessments.**

1.2. Ensuring sufficient flexibility is becoming a key challenge

Ensuring security of supply requires deploying enough (clean) flexible resources to complement intermittent renewable energy generation. A range of flexibility options is needed, from short- (hourly, daily) to long-duration (seasonal, interannual) ones. Demand response and storage have the potential to be major providers of short-duration flexibility. The provision of long-duration flexibility, where traditional thermal generation plays a key role now, will likely be more challenging. Technological innovation will need to play a role in providing such long-duration flexibility.

With the following actions, policymakers can foster the deployment of flexible resources. First, the system should be designed in a way to provide signals for potential investors and innovators to develop new flexible resources. These signals should preferably come from market prices, network tariffs, ancillary services or as a fallback from state support mechanisms. Secondly, any unjustified barriers (including those identified in ACER's report on barriers to demand response and other distributed energy resources) to development and deployment of flexible resources should be removed. Thirdly, there is a need to adopt and implement a legal and regulatory framework to enable demand-response and energy storage to fully develop their potential.

Recommendations:

3. **Policymakers to remove barriers and to develop market rules supporting the deployment of non-fossil flexibility resources.**

4. **EU legislation with a clear regulatory framework for demand response and distributed flexibility to be further developed and implemented.**

Commitment:

a) **NRAs commit to overcoming regulatory entry barriers for market participation in the several timeframes that may be faced by decentralised flexible resources and new business models.**

1.3. Well-functioning long-term power markets are essential for investment stability

The transition to a decarbonised electricity system will require massive investments. Providing investment certainty and predictability is key to delivering these investments at the lowest cost. A well-functioning and efficient forward electricity market provides transparent, robust, independent, and possibly the only signal for the value of electricity for couple of years in the future. This price information provides a crucial foundation for pricing in other longer-term markets, such as power purchase agreements (PPAs), contracts for difference (CfDs), and capacity mechanisms, extending beyond three years.

If market signals do not trigger sufficient investment, regulatory interventions such as support mechanisms or using revenues from ETS, accompanied by green fiscal policy, can step in. Provided that these are well designed, they can both drive additional investments and ensure security of supply. Furthermore, optimising the interaction between flexibility and adequacy support mechanisms can also help keep cost to consumers down while fostering investment decisions (as opposed to introducing fully separate mechanisms). Price support schemes such as CfDs can also address the gap in investment stability. Nevertheless, Member States should carefully design support mechanisms to minimise the distortions these mechanisms often have on investment decisions, the long-term market as well as the short-term market. For this reason, EU energy regulators call for a more coordinated best-practice approach in designing these mechanisms, through some EU guidance.

Recommendation:

5. **European Commission to develop best practices on the design of CfDs, flexibility support schemes and capacity mechanisms to minimise their market distortions.**

2. Enhanced electricity distribution networks and empowered consumers in decarbonised markets

2.1. Distribution networks are the new gateway for achieving a flexible and decarbonised energy system

Decarbonisation and electrification will drive significant changes at the distribution level. Additional distributed generation and consumption will create further challenges for the electricity distribution systems, in terms of both connection capacity and managing dynamic bidirectional electricity flows, all the while remaining secure and cost-efficient. Increasingly, new market actors may request network and consumption data to provide energy management and flexibility services to network users and system operators. Distribution system operators (DSOs) will face several challenges and dilemmas, namely (i) investing in capital-intensive grid reinforcement such as cables/lines and transformers; (ii) making smart investments to increase the capacity and the resilience of the existing grid; and (iii) incentivising network users to adjust their demand or generation to support the power system. Two measures are needed to address these challenges. First, regulators need to establish a proper regulatory framework for DSOs to develop solutions to address such challenges cost-efficiently. Secondly, wholesale markets may be complemented with local markets for distributed flexibility services.

The changes in distribution networks will require DSOs to take on a considerably more active role in facilitating the market, providing the necessary data/information efficiently and activating different ancillary services. It will therefore become increasingly important that DSOs be independent from any (vertically integrated) generation or consumption assets. Ownership unbundling between DSOs and energy utilities should be a way to effectively achieve such independent public service provision. Where ownership unbundling is not possible or appropriate, alternative solutions should be developed to take care that DSOs ensure fully neutral and non-discriminatory third-party access to their grid, and to optimise operations, guarantee neutrality and advance digitalisation.

Recommendations:

6. **Establish and continue improving EU legislation for a clear regulatory framework for distribution networks and local markets for distributed flexibility services.**
7. **European Commission and policymakers to strengthen rules ensuring fully neutral role of electricity DSOs.**

2.2. Consumers can be powerful allies in providing flexibility

As generation becomes more intermittent, to moderate flexibility-related cost and to ensure security of supply, consumers should become more aware and active in how they use energy. Flexible distribution level consumption has the potential to provide massive, short-duration flexibility to the electricity system as well as allowing the consumer to benefit from the energy transition e.g. via cheaper energy prices. Given that consumers all have different needs and characteristics, they should be provided with a variety of options that enable them to adjust their consumption (or locally store electricity) to enable flexible electricity system operation. Energy national regulatory authorities (NRAs) should ensure via their regulatory frameworks that electricity suppliers and/or aggregators can provide flexible options, ranging from time-of-use prices to dynamic contracts exposed to day-ahead or other short-term prices and demand response, while providing fixed-price contracts that are fit-for-purpose. Consumers need to receive regular information regarding when it is best to consume (or not), e.g. via mobile push notifications. Similarly, to enable a larger number of consumers to provide flexibility services, automation and delegation to a service provider may be necessary. Importantly, data management rules and protocols must be robust and fit-for-purpose. Finally, all large consumption devices (such as electric vehicle chargers, heat pumps and large home appliances) should be provided with automated

and controllable technical interfaces to facilitate flexible consumption. As retail markets evolve to provide a variety of flexibility services and offers, market rules and regulatory oversight of third-party intermediaries (e.g. energy brokers, online comparison tools and other energy service companies (ESCOs)) should be reinforced.

Recommendations:

8. **EU Commission to develop guidance to ensure that suppliers offer the whole range of pricing schemes (from dynamic to variable to fixed price contracts) tailor-made to incentivise system flexibility as well as providing choice for all types of consumers.**
9. **EU legislation should be reinforced to close the regulatory oversight gap for other retail market participants, e.g. third-party intermediaries, as new types of flexibility offers and services emerge.**

At the same time, the transformation of the electricity system must protect vulnerable consumers by providing dedicated energy services and advice and facilitating access to these services. This may involve targeted and tailored financial assistance, community-based programmes or incentives that alleviate barriers to active energy participation and safeguard against the risk of social exclusion and financial hardship.

Recommendation:

10. **Policymakers should ensure that targeted and tailored support for vulnerable consumers is consistent with wider social policies and where possible, aim to address the root cause of the energy poverty.**

3. Moving towards European electricity transmission infrastructure development and cost sharing

3.1. Improving transmission infrastructure development

Changes in the generation technology (intermittency) and its location will lead to more energy being transported through the transmission network and across longer distances as well as increased redundancies in the system, i.e. higher generation and transmission capacity for a given demand level. The existing network development process consists of (i) a pan-European approach to identify infrastructure needs (based on EU scenarios and EU methodologies) and (ii) of a bottom-up approach which proposes projects addressing those needs from a unilateral or bilateral perspective only and which may not accurately reflect the European interest in developing common pan-European infrastructure.

First, the needs assessment performed at pan-European level should be further improved, made more transparent, reliable and replicable. Second, EU energy regulators call for the introduction of a complementary EU planning approach that helps identify infrastructure solutions of regional interest with an EU dimension. This may involve empowering regional or EU entities to propose additional/alternative high-level infrastructure solutions. Also, ACER should monitor cases when certain infrastructure needs are not addressed by any project proposed by transmission system operators (TSOs), and energy regulators should be empowered to request TSOs to develop proposals for concrete projects to address such infrastructure gaps.

Third, Electricity transmission infrastructure development should also be closely coordinated with other energy sectors such as fossil gas and hydrogen. In this respect, the current practice of single sector infrastructure needs assessments needs to be enhanced towards a multi-sectoral planning at EU level (which could also require more reflection on the related governance), and preferably also at national level. Coordination is also needed between development at generation and grid levels, accommodating the different lead times for project completion (with infrastructure development usually taking longer than generation development). Finally, delays in electricity infrastructure build out remain a major issue. This requires efficient permitting rules and procedures, additional attention to public acceptance and awareness, stable and robust supply chains and effective investment decision making.

Recommendations:

11. **Amend the EU legislation to ensure full transparency of the pan-EU assessment of infrastructure needs, and to discontinue the single-sector infrastructure planning in favour of a multi-sectoral one at European level.**
12. **Currently, the Ten-Year Network Development Plans (TYNDPs) are built bottom-up from the national projects. Amend EU legislation to introduce a complementary EU planning approach to identify regional electricity infrastructure solutions with an EU dimension and empower energy regulators to request TSOs to develop proposals for projects to bridge infrastructure gaps.**

3.2. Recognise shared benefits of electricity infrastructure and share costs accordingly

Network infrastructure is a key enabler of a well-functioning internal electricity market. While the internal electricity market efficiently distributes the benefits and costs of electricity generation, the costs and benefits of network infrastructure are not yet shared in a comprehensive and efficient manner. Already, due to the strong interconnectedness of the European electricity network, most (existing and new) transmission lines contribute to regional or pan-EU benefits to some extent.

Currently, there are at least three fragmented mechanisms that enable the sharing of costs and benefits, namely cross border cost allocation (CBCA), inter-TSO-compensation (ITC), and congestion income distribution (CID). These three mechanisms fall short in adequately addressing the equitable sharing of infrastructure cost and benefits arising from cross-border trade. Energy regulators should conduct a holistic review of the above mechanisms and ensure that the general framework for sharing the costs and benefits of infrastructure is based on a comprehensive cost allocation. The review should ensure that cost-sharing better reflects the wider EU benefits of infrastructure and the various types of electricity flows (internal, cross-border etc).

Commitment:

b) Energy regulators commit to consolidate and improve the current regulatory approaches to better share the cost and benefits of electricity network infrastructure arising from cross-border trade.

4. 'Efficiency first' principle also applies to existing network and generation

Significant amounts of new investments in the infrastructure, generation and demand will be needed to support decarbonisation and electrification objectives. These investments will likely exert significant upward pressure on network costs and, consequently, overall electricity costs. It is therefore important to extract the maximum value from both existing and future assets to reduce the need for additional investments. This will ensure that consumers benefit from the lowest electricity price possible within the capabilities of existing assets and reduce the need for new investments to some extent.

4.1. Network costs must be allocated through fair and cost reflective tariffs

Energy regulators see the rise in grid investment and commensurate knock-on effects on network tariffs as a significant challenge ahead, which also policymakers need to remain aware of. This puts a premium on lowering the overall network costs, including by pursuing cheaper solutions to the needs for additional grid capacity that would complement build-out and by developing advanced network tariffication models fit for a rapidly changing energy system. This will also require significant effort by network operators to further upgrade, digitalise and professionalise their operational practices, not least at distribution level.

Related to this, energy regulators forecast a rise in the network tariff component of consumer electricity bills going forward. This in turn may give rise to pressures on regulators and governments towards shifting the network tariff burden from certain consumers to other consumers or to socialise network tariffs via the tax base. Energy regulators call here for strong prudence from policymakers as to the possibly detrimental effects of doing so. Moreover, energy regulators find coordinated approaches amongst Member States highly preferable in this regard, compared to what might otherwise become inter-Member State competition via network tariffs.

Commitment:

c) **Energy regulators commit to jointly develop best practices for network tariff structures that are cost-reflective, non-discriminatory and fit for the new challenges facing our energy system, in particular accurately rewarding flexibility and the use of innovative grid technologies.**

4.2. Continue improvements in EU electricity market governance and speed-up implementation of the EU framework

Efficient market design should deliver electricity from the cheapest generators to consumers and maximise the utilisation of the network. While market rules have significantly improved, regulators continue to observe significant problems in their implementation, particularly due to long implementation delays in many integration projects such as improvements in market coupling and cross-zonal capacity calculation. Although the reasons for these delays are multifaceted, energy regulators believe that better governance (ensuring that all involved entities work as one), and effective enforcement procedures are needed. Both interventions require setting up good governance rules with a proper balance between centralised and decentralised solutions, supported by appropriate institutions. Energy regulators can also contribute to reduce delays, first by developing further incentive framework for TSOs, nominated electricity market operators (NEMOs) and other entities for early implementation of projects and second by consistent and effective enforcement of compliance in case of delays (which requires effective coordination at regional or EU level).

Market rules should also be further improved to increase market efficiency. Notable room for improvement is in congestion management (with higher locational granularity in electricity pricing), cross-zonal capacity calculation, system operation (e.g. TSO-DSO coordination), balancing reserve

dimensioning and procurement, and unlocking the potential of distributed flexible resources. These improvements can mainly be achieved through future amendments of EU Regulations.

Recommendations:

13. **EU Commission to complete the governance rules for the single EU electricity market tailored to system developments.**
14. **EU Commission to propose legislative improvements in electricity congestion management and balancing.**

Commitment:

d) **Energy regulators commit to develop (further) incentive frameworks for TSOs, NEMOs and other entities for earlier implementation of integration projects and to improve the enforcement of compliance in case of delays.**

4.3. Non-wire alternatives can significantly increase the capacity of the existing power grid

Another category of improvements involves low-capital investments and that can make the use of existing network assets more efficient such as dynamic line rating better monitors weather conditions on wires allowing the network operator to adjust the power line capacity in real-time. However, system operators might generate more revenues with capital-intensive investments such as building new lines (under regulated asset base frameworks). Whenever it comes to investments in new network infrastructure, the system operators should first investigate other possible options to deliver higher network capacity with less capital-intensive solutions or combine new network investments with these solutions. Regulatory tools, such as financial incentives that align system operator's remuneration with societal benefits of less capital-intensive solutions, may contribute to address system needs in a cheaper and faster manner.

Commitment:

e) **Energy regulators commit to (further) develop incentive frameworks for power system operators to apply the most cost-effective solutions to increase the capacity of the network.**

5. Independent regulators can help address these challenges comprehensively and strengthen Member States' trust in the EU electricity market

Strong and independent energy regulators are crucial actors in the energy transition, as they provide expert advice and decisions free from partial and private interests. This helps ensuring sustainable and affordable development of the system and lowest prices for consumers. To deliver these benefits, energy regulators must be properly equipped to exercise their responsibilities.

While regulators have important functions and tasks in wholesale markets and consumer issues, there are uneven practices amongst Member States in terms of involving regulators in issues such as resource adequacy and infrastructure planning. Regulators see merit in further alignment in these areas.

Recommendations:

15. **Policymakers should therefore safeguard the independence of regulators and should provide them with sufficient resources to carry out their mandated tasks.**
16. **EU institutions to strengthen regulators' role in the areas of infrastructure planning and adequacy.**

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