Efficient and flexible consumers for smart electricity grids

smartEn Position Paper

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As the EU strives for climate neutrality, the electricity grid is facing important challenges due to the rapid growth in variable renewable generation and electricity consumption across end-users: buildings, transports and industries. In some areas, grids are already under stress and electricity grid congestion will soon become an urgent issue across Europe, not limited to The Netherlands. As a result, the EU grid-related actions should be framed around the need to address the grid congestion challenge.

"Grids need to be an enabler, not a bottleneck in the clean energy transition[1]"
Commissioner for Energy, Kadri Simson

The EU Grid Action Plan rightly recognises the pivotal role of grids in the energy transition, but recent strategic reflections within the Clean Energy Transition Dialogue on infrastructure and ministerial discussions mostly focus on large scale grid infrastructure. While grid expansion and reinforcement are necessary for ensuring the reliability and resilience of Europe's electricity infrastructure, experience shows that new cables are highly expensive and long to deploy, faced with administrative burden and rising supply-chain issues, taking typically between 5 to 10 years. This will not keep pace with new connection requests nor address rapidly the congestion issues. This creates a risk to waste precious financial resources in stranded assets, which will simply result in more costs for citizens and society at large, and to put the European Green Deal in standby.

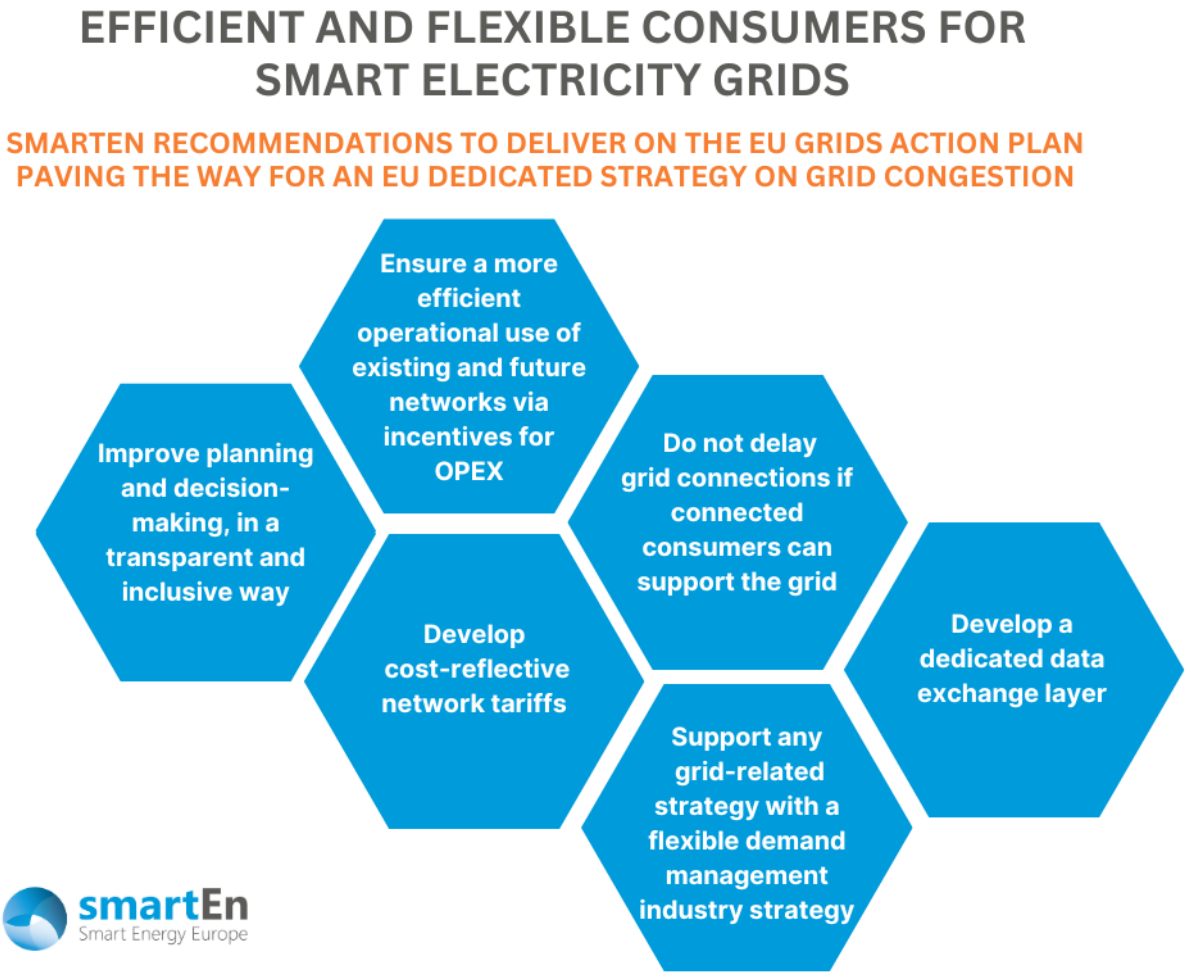
Making better use of the grids thanks to the contribution of existing and future connected flexible consumers is an efficient approach to tackle urgently the congestion challenge, while postponing or permanently reducing the need for investments in the construction of new grid capacities[2]. More attention should be given to non-wire alternatives that seek to optimise the use of the grids and cost-effectively achieve the European Green Deal objectives. Fortunately, this coincides with increasing electrification in various sectors, which offers greater flexibility for the power system thanks to the rise of decentralised energy resources such as electric vehicles, heat pumps, batteries, and building energy management systems.

The Flexible Demand Management Industry[3] that smartEn represents can empower grid users, i.e. grid connected buildings, industries and electric vehicles, to play an active role in supporting an efficient and smart operation of grids. However, grids must be incentivised to use the flexibility of connected consumers, as already prescribed by EU laws.
To support this effort, this paper:

- **Sets out six strategic recommendations for the smart operation of grids** which should guide the efficient delivery of the EU Grids Action Plan.
- **Lays the groundwork for a dedicated EU Strategy on Grid Congestion** which the new Commission should develop to deliver the European Green Deal by 2030[4]. Such a strategy should foster harmonised approaches to tackle grid congestion issues across the EU, without waiting for lengthy network reinforcement, by harnessing the potential of connected, flexible consumers.

[1] https://ec.europa.eu/commission/presscorner/detail/en/ip_23_6044
[2] Between €11.1 and 29.1 billion can be saved annually in distribution grid reinforcements through a smart and active management of grid-edge, flexible consumers – smartEn/DNV, Demand-side flexibility in the EU: Quantification of benefits in 2030, September 2022
[3] smartEn Position Paper on the Flexible Demand Management Industry https://smarten.eu/wp-content/uploads/2024/04/smartEn-position-paper-Flexible-Demand-Management-Industry_final.pdf
[4] This is one of smartEn's priority asks for the EU legislature 2024/2029: https://smarten.eu/wp-content/uploads/2024/03/smartEn-EU-priorities-2024_2029_last-final-2.pdf

smartEn also calls for the Copenhagen Energy Infrastructure Forum dedicated platform foreseen in the EU Grid Action Plan to be open to stakeholders providing services and distributed solutions to system operators, contributing to the optimisation of Europe's electricity grids. Such an inclusive process will further support the delivery of the Action Plan and should be at the core of future industrial roundtables on electricity grids[5].



[5] As foreseen in the conclusions of ENTSO-E high-level roundtable on electricity grids in Europe (5 April 2024).

1. IMPROVE PLANNING AND DECISION-MAKING, IN A TRANSPARENT AND INCLUSIVE WAY

Improved network planning and decision-making are essential to identify relevant grid investments and avoid lock-in in infrastructure development or waste of financial resources in stranded assets at both transmission and distribution level.

- A robust assessment of network needs requires to contemplate both grid and non-grid solutions

Current assessments conducted by system operators, such as the European Resource Adequacy Assessment[6] and long-term planning through the TYNDP, tend to have conservative calculations – often limited to (large) storage - of the flexibility that could be provided by consumers connected to both TSO and DSO networks as an alternative to grid expansion. This leads to an overestimation of the necessity for grid reinforcement. For instance, the flexibility potential of industries, commercial and residential buildings, and of electric vehicles providing vehicle-to-grid services, is systematically minored.

Improving the methodology and elaboration process of these assessments is essential to better incorporate the contribution of demand management solutions from connected consumers. This calls for an inclusive process involving relevant stakeholders, including flexibility service providers, consumers and local authorities.

A similar inclusive process is necessary for the assessment of flexibility needs of electricity systems. It is therefore important that this assessment is not limited to storage - as mentioned in the EU Grid Action Plan - when considering the potential of non-fossil flexibility resources, but shall also take into account the demand response potential, in line with the revised Electricity Market Design.

At distribution level, the Electricity Market Design is clear: distribution network development plan shall include the use of demand-side flexibility as an alternative to system expansion and consult all relevant system users on their network development plans.

Yet, further efforts are currently needed to ensure proper implementation of this requirement. The EU Grids Action Plan foresees that the EU DSO entity explores case studies and best practices and publishes recommendations to improve distribution network planning. Yet, this action is thought of as a way to accelerate grid expansion, diverging from the above-mentioned legal requirement of article 32 of the Electricity Directive that requires the use of demand-side flexibility as an alternative to grid expansion. The market-based procurement of flexibility services from connected consumers should be strengthened and be a priority topic for such case studies and best-practices. Such best practices can be found in Great Britain with clear incentives to consider demand-side flexibility in distribution network development plan, or in the Netherlands and Norway with effective local flexibility markets that allow joint DSO-TSO flexibility procurement, enabling system operators to solve issues in the grid more effectively. [7].

- A transparent and inclusive Cost-Benefit Analysis (CBA) should guide network decision-making

Following a sound assessment of network needs, a CBA should be performed to decide on which investments are needed in the short-, medium- and long-term, weighing equally the utilisation of non-wire solutions (OPEX) and grid reinforcement (CAPEX). It should take into account the speed at which

[6] https://smarten.eu/wp-content/uploads/2024/03/smartEn-letter-ERAA-2023_final.pdf
[7] https://smarten.eu/wp-content/uploads/2022/07/Spotlight-Local-Flexibility-Markets.pdf

each solution can be implemented, the value of keeping options open longer, and the potential impact of additional costs on consumers. However, current CBA are not yet putting on a equal footing OPEX and CAPEX solutions as shown in the recent ENTSO-E Guidelines for CBA of grid development projects.

Efforts should be accelerated to recognise the maturity of indicators used to assess the contribution of demand-side flexibility and to develop relevant methodologies for the quantification and monetisation of demand-side flexibility services.

A sound CBA should also be the approach used by Member States when writing their National Energy and Climate Plans (NECPs) and by the Commission when assessing grid-related actions of the NECPs.

The CBA should be carried out in a transparent way, allowing all stakeholders to have access to relevant and non-confidential information about current and forecasted grid congestions as well as assumptions made on demand, generation and expected flexibilities, and be made aware of all options contemplated and take part in decision-making.

This will help get insight into the location and time of the grid congestion, enhance trust in new technologies, and promote a collective, participatory approach to a common issue.

This approach would require the establishment of a structured dialogue between local authorities and system operators, which is often missing. For instance, a municipality should be involved in the decision-making process of a distribution system operator to solve a local congestion. As a result, the municipality could mobilise citizens and help set up local energy communities that self-balance the congested area and alleviate grid management issues.

On top of this collaborative, concerted actions on the ground, it is recommended to have regular meetings of a standing high-level group at European level, to assess the application of this approach.

Alongside such a CBA, system Operators should accelerate the development of a digital twin of the grid to conduct comprehensive 'what-if' scenario analyses and allow NRA to determine which investments are efficient.

Actions of the EU Grids Action Plan targeted by this recommendation:

- *Action 2: ENTSO-E to enhance top-down planning towards 2050*
- *Action 3: EU DSO Entity to support DSO grid planning by mapping the existence and characteristics of distribution development plans*

2. ENSURE A MORE EFFICIENT OPERATIONAL USE OF EXISTING AND FUTURE NETWORKS VIA INCENTIVES FOR OPEX

As foreseen by EU legislation, grid congestions should be solved in a market-based way, not via unilateral interventions by system operators, such as direct disconnections of consumers. Providing incentives to system operators for the market-based procurement of flexibility shall be an urgent priority task for NRAs to ensure a more efficient and operational use of networks, in line with the Electricity Market Design. This can be achieved by:

- Putting on an equal footing capital and operational expenditure (CAPEX and OPEX)

Most network operators today benefit from financial incentives that encourage them to invest in new cables rather than procuring flexibility services from connected parties, due to prevailing CAPEX remuneration. NRA shall allow for the efficient remuneration of system operators following a TOTEX

approach that considers capital and operational costs equally as eligible costs to be recovered. This should be complemented by performance targets set by the NRA to incentivise system operators to increase the efficiencies of the operation of their networks, in line with the obligation of the revised Electricity Market Design[8].

While the EU Grids Action Plan rightly stresses the need to recognise operational costs, it actually falls short in following through this approach when it comes to anticipatory investments, as they are only contemplated from a grid build-out approach, meaning only CAPEX-focused. This is not in line with the revised Electricity Market Design.

If anticipatory investments are contemplated, they shall include OPEX alternatives that would postpone or replace CAPEX, adopting a TOTEX approach. They shall be backed up by the above-mentioned CBA and detailed analysis of future energy system needs. Such analysis should be based on transparent information from system operators and in consultation with stakeholders, to assess the risks of a project to become a stranded asset – a cost which ultimately will be borne by all. Such approach and conditions should be clearly set out in the Commission guiding principles on anticipatory investments.

- Including costs related to demand-side flexibility within OPEX

Today, OPEX costs are largely linked to human resources costs[9] and do not account for costs associated with the smart and efficient operation of the grid, such as costs of digitalisation, data processing and flexibility procurement. For instance, OPEX aimed at procuring flexibility on trading platforms set up by independent market operators to support the establishment of DSO's Local Flexibility Markets, selected through a competitive tendering process, should be accounted for in the regulated asset base to allow system operators to receive a return on these OPEX.

ACER should be tasked with establishing a harmonized framework outlining the costs eligible for OPEX to ensure appropriate compensation. This framework would guide NRAs in setting or approving system operators' tariffs and methodologies.

- Raising awareness among System Operators

Raising awareness on innovative solutions and market offers to use flexibility for smart and efficient grids is crucial. Yet, these solutions, even if already available, are not sufficiently used by system operators. Besides the lack of incentives to use them, many system operators are not aware about those solutions and their benefits nor have the capability to do so.

Internal knowledge sharing platforms among system operators, such as the Technopedia tool and the Knowledge Sharing Academy of EU DSO Entity, should address this gap by identifying such solutions and not only CAPEX-focused ones, including both technologies and services that System Operators can procure.

This approach will enhance System Operators' confidence in securing adequate flexible capacity through contracts with flexibility service providers, thereby facilitating cost-effective mitigation of grid congestion.

[8] Article 18 on Charges for access to networks and use of networks and reinforcement of the revised Electricity Regulation

[9] As rightly pointed out in the EU Grids Action Plan

Actions of the EU Grids Action Plan targeted by this recommendation:

- *Action 4: Commission to propose guiding principles identifying conditions under which anticipatory investments in grid projects should be granted*
- *Action 7: ENTSO-E and EU DSO Entity to promote uptake of smart grid, network efficiency and innovative technologies*
- *Action 8: ACER, in its next tariff report, to recommend best practices in relation to the promotion of smart grids and network efficiency technologies through tariff design, focusing on the consideration of OPEX in addition to CAPEX and benefit sharing*

3. DEVELOP COST-REFLECTIVE NETWORK TARIFFS

Demand-side flexibility (DSF) plays a crucial role in achieving an efficient and cost-reflective use of the grid. However, the full potential of the active participation of energy end-users is limited, among others, by network tariffs that do not reflect the real costs of the grids' use. While some fixed costs can be maintained in network tariffs, all connected consumers must also receive dynamic signals that reflect their use of the network or reward their support to the grid, to allow adjustments and avoid grid reinforcements.

Cost-reflective network tariffs are a requirement already set by the 2019 Electricity Market Design. However, their implementation has been very slow and did not lead to significant changes in tariffs structure by System Operators across the EU. Currently, there is no harmonised approach for the design of cost-reflective network tariffs that Member States could use as a guide to implement them.

Beyond a collection of best practices regarding tariff design, ACER should engage in the definition of an harmonised European methodology and identify common features for cost-reflective network tariffs that reflect the real use of the grid and incentivise decentralised energy resources supporting the grid.

In particular, cost-reflective network tariffs should provide visibility on the long-run marginal costs of the network and not only focus on recovering past investment costs. With this approach, cost-reflective network tariffs provide incentives to System Operators to improve the operation of their grids in the long term while sending signals to connected consumers to make the most efficient use of available grid infrastructure.

Action of the EU Grids Action Plan targeted by this recommendation:

- *Action 8: ACER, in its next tariff report, to recommend best practices in relation to the promotion of smart grids and network efficiency technologies through tariff design, focusing on the consideration of OPEX in addition to CAPEX and benefit sharing*

4. DO NOT DELAY GRID CONNECTIONS IF CONNECTED CONSUMERS CAN SUPPORT THE GRID

Significant delays in connecting distributed renewable energy sources, newly electrified households, cars, and industries not only hinder electrification efforts, but also impede consumers' ability to contribute with their flexibility to balance an increasingly variable energy system. Pragmatic solutions can be implemented rapidly to mitigate these delays and should be encouraged:

- Provide information on grid hosting capacity and network congestion

The pan-EU overview of grid hosting capacities, to be established by ENTSO-E and EU DSO, should extend beyond informing new network users about connection feasibility. It should also serve to

identify areas where Flexibility Service Providers can intervene to bolster grid resilience by unlocking the flexibility of already connected grid users or developing new flexibility resources where it would have the most value. This information can also be used to set Local Flexibility Markets. As a result, the pan-EU overview of grid hosting capacities should be complemented with regularly updated information on network congestion. This would also provide a solid input to the CBA that should guide network planning decisions.

- Prioritise connection to grid-users that can provide flexibility services and mitigate congestion

Priority grid connections should be allocated to new grid-users who can engage in flexibility services to participate in congestion management and contribute to grid optimisation. This could be ensured if individual consumers self-balance their different Decentralised Energy Resources (DERs) deployed behind-the-meter and/or if a group of consumers, clustered in a community or a local initiative for example, are self-balancing all their DERs, thus mitigating stress to the grid. However, in both cases, self-balancing of distributed renewable generation, energy storage facilities, smart and bidirectional charging, and demand management solutions should happen in reaction to market-based signals provided by system operators.

For example, in the Netherlands, the Grid Network Code on "capacity limiting contracts" foresees that only local energy communities that ensure balancing of all generation, storage and consumption assets part of a local scheme can be connected to the grid.

Local self-balancing should be introduced as a fundamental prerequisite for all local energy initiatives in order to foster their growth and ensure both participating consumers and System Operators benefit from their development. This should be supported by a dedicated guidance from the Commission to Member States and financial support to all local energy initiatives that self-balance distributed assets part of the local schemes.

- Set an harmonised framework for flexible connection agreements when new firm connections are not immediately feasible

Flexible connection agreements can ensure that consumers and prosumers are connected to the grid. An harmonised EU framework is missing now and clarity is needed to ensure such non-firm connections are compatible with a consumer-centric energy system, and do not hinder the development of market-based procurement of flexibility. In particular:

  - such non-firm agreements should not delay or prevent System Operators in their task of fostering Local Flexibility Markets;
  - they should only be signed when the necessary flexibility cannot be purchased in a market (long and/or short term) and be implemented as a solution of last resort if the conditions for applying non market-based alternatives are met, in line with article 32 of the Electricity Market Design;
  - Where signed, their activation should be in competition with flexibility from other grid users, ensuring the activation of the cheapest resources;
  - Grid-users with flexible connection agreements should be able to provide their flexibility to all markets and have a right to participate in aggregated flexibility offers;
  - In case of urgent need to enable the connection of new consumers with the goal to further electrification, the necessary processes should be in place to provide consumers with a full connection by 2 years if they wish so, and with the commitment of the DSO to procure flexibility on a market-base.

Action of the EU Grids Action Plan targeted by this recommendation:

- *Action 6: ENTSO-E and EU DSO Entity to agree on harmonised definitions for available grid hosting capacity for system operators and to establish a pan-EU overview*

5. SUPPORT ANY GRIDS-RELATED INDUSTRIAL STRATEGY, WITH A FLEXIBLE DEMAND MANAGEMENT INDUSTRY STRATEGY

Grid and non-wire alternatives must go hand in hand. If a specific industrial support is needed for large-scale grid technologies and copper deployment, the same attention should be given to companies offering smart and distributed management services to System Operators and consumers to activate their flexibility for systemic needs.

These companies, representing the Flexible Demand Management Industry, play a crucial role in addressing network congestion and supporting the cost-efficient transformation of electricity grids. It is essential to fully recognize their contributions and establish a supportive framework to stimulate business models for demand-side flexibility. The delivery of the EU Grids Action Plan, should carefully consider its impact on the development of the Flexible Demand Management Industry in Europe.

Likewise, technical requirements for the connection of new demand and generation projects can have important implications on how the connected assets will be able to provide their flexibility to the system. Today, these technical requirements vary across Europe and the ongoing revision of the Demand Connection and Requirements for Generators network codes should seek to further harmonise them to facilitate the access of smart and flexible assets to the EU Single Market. At the same time, these Network Codes should not consider the direct disconnection of connected assets as a demand-response instrument as this would maintain persisting barriers to the market-based procurement from demand-side flexibility by System Operators. Such disconnection should be a last resort mechanism, only if no other market-based solutions are available and limited to a clearly defined emergency situation.

Actions of the EU Grids Action Plan targeted by this recommendation:

- *Action 9: Commission to identify tailored financing models and strengthen dialogue to address obstacles to private financing.*
- *Action 14: Commission to promote common technical requirements for generation and demand connection*

6. DEVELOP A DEDICATED DATA EXCHANGE LAYER

An efficient and smart management of grids requires a seamless, interoperable access and sharing of data. Both TSOs and DSOs need to use modern existing standards, such as IEC 62325 already used by TSOs, for harmonised APIs for data sharing among System Operators to enable market coordination and adequate network planning. It is also paramount that System Operators harmonise their communication protocol with flexibility service providers, to support the uptake of their activities.

Investments to support seamless data exchange between system operators, flexibility service providers, consumers and prosumers, should not be delayed further. Work on standardisation and harmonisation efforts should be at the core of ENTSO-E and EU DSO entity Joint Working Group on

data interoperability to promote the uptake of innovative, digitally driven services providing flexibility to the grid.

Action of the EU Grids Action Plan targeted by this recommendation:

- *Action 7: ENTSO-E and EU DSO Entity to promote uptake of smart grid, network efficiency and innovative technologies*

About smartEn - Smart Energy Europe

smartEn is the European business association integrating the consumer-driven solutions of the clean energy transition. We create opportunities for every company, building and car to support an increasingly renewable energy system. Our membership consists of the following companies:

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