DISCUSSION PAPER

Reflections and Recommendations regarding

FLEXIBILITY USE ON DISTRIBUTION LEVEL

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Reflections and Recommendations regarding Flexibilty Use on Distribution Level

Significant changes in the European energy system over the last decade have been driven by increasing deployment of intermittent renewable generation, decarbonisation, and digitalisation. In general, we are transitioning away from a power system in which controllable power stations follow electricity demand, to an overall efficient power system where flexible producers, flexible consumers and storage systems respond to increasing intermittent supply of wind and solar power. In addition, most of the new generators (both in number and capacity) are being connected to distribution networks. Under these new conditions, secure and efficient system operation is dependent on improving system flexibility. The need for all sorts of flexibility spans from grid infrastructure to dispatchable generation, from balancing to wholesale electricity arrangements, and from gas market flexibility to demand response.

Enabled by smart meters, digitalisation and growing volatile price signals on the wholesale markets, many network users (= end consumers) will increasingly respond to market price signals at the same time and with similar consumption patterns. This change in electricity demand on low and medium voltage levels and the related increase of simultaneous consumption can lead to an increase in distribution network reinforcement needs, especially if load substantially includes new types of consumers, such as electric vehicles (EVs), heat pumps, battery storage or smart home automation systems for example. Thus far, low voltage planning rules and operational principles do not account for integrating EVs and battery storage combined with different levels of distributed generation such as solar and wind. Furthermore, the spot market price may send a signal (e.g., low commodity prices) in opposite direction to the current local weather and distributed generation situation in specific regions (i.e., peaks in the local distribution networks) which may aggravate the problem.

Distribution System Operators (DSOs) are facing many challenges in adapting to this new reality, with the main one being the occurrence of grid constraints / local congestion. Historically, congestion at the distribution level has been dealt with through planned upgrades of distribution system components. Such upgrades however, on the one hand are quite costly and on the other hand, cannot follow the fast uptake of distributed energy resources (DERs) in the distribution network in all cases. Therefore, active congestion management is becoming increasingly important. The use of flexibility – i.e. adjusting the demand profiles to the supply peaks in renewable generation – can help DSOs to prevent local congestion and avoid power quality problems. In the short-term, flexibility can help releasing pressure on the distribution network and in the long-term, flexibility can serve as an alternative to network reinforcement when it is more cost-efficient than traditional reinforcement measures.

These overall developments and the suggested use of flexibility put the role of the DSO in accessing flexibility services and the needed update of accompanying regulatory frameworks into the spotlight. Crucial is the question how tools and principles to enable flexibility use at the distribution level go hand in hand with neutrality on part of the DSO. Since, in order to avoid market distortions, it remains essential that DSOs are neutral when performing their tasks and are sufficiently unbundled from the interests of flexibility providers.

The Clean Energy Package which was agreed between EU Member States in December 2018 provides in Article 32 of the Electricity Market Directive that DSOs shall procure flexibility services according to transparent, non-discriminatory and market based procedures unless regulatory authorities have established that the procurement of such services is economically not efficient or if this leads to severe market distortions or to even higher congestions. Once the Electricity Market Directive has officially entered into force (expected by summer 2019), these provisions need to be implemented on national level. From a market-driven perspective, which inherently is the lens used by EER members, we would like to provide our views and suggestions in order to enhance the overall discussion on the subject.

Models enabling DSOs' access to flexibility

In his flexibility-related work[1] the Council of European Energy Regulators (CEER) has described four models which principally enable DSOs' access to flexibility:

- **Rules-based approach** – codes and rules, which impose detailed flexibility requirements
- **Network tariffs** – tariff structures may be designed to encourage network users to alter their behaviour for a more efficient use of the distribution network
- **Connection agreements** – DSOs could reach arrangements with customers for the provision of flexibility where a Member State considers this an appropriate measure
- **Market-based procurement** – DSOs can explicitly procure flexibility that benefits the grid services from the market(s). The flexibility could be procured via contractual arrangements or in a short-term market, e.g. via a platform or other forms of interfaces, given there is enough liquidity and arrangements for the market-based procurement do not unduly distort markets and comply with unbundling rules.

Along with the general description of the four models, CEER clearly stated that none of the models should be defined in detail at EU-level but rather by the Member State or the National Regulatory Agency on a national level as the applied model should be consistent with national provisions and practices.

From EER's point of view, it will be of utmost importance to define **a limited and clear set of valid flexibility products on the distribution level in order to keep transaction costs for market participants** as low as possible while ensuring high transparency and market liquidity. As for standardized EU definitions of flexibility products, we would suggest prudence with regard to the different situations in EU Member States. Guiding principles may be more useful on EU level. Obviously, **the framework conditions for flexibility products should be similar in different Member States in order to prevent market distortions.**

Furthermore, CEER suggests that different kinds of flexibility options should ensure technology neutrality, i.e. the different sources of flexibility, varying from demand response to storage and generation, should be given equal possibilities to provide arrangements for the provision of flexibility. **EER is strongly supporting CEER's view on technology neutrality**: All sources of flexibility (demand, generation and storage) should be treated equally and under cost-efficient

[1] CEER (2017): Guidelines of Good Practice for Flexibility Use at Distribution Level – Consultation Paper and CEER (2018): Flexibility Use at Distribution Level – a CEER Conclusions Paper

aspects, competing against each other in the market on equal terms. However, today equal treatment is not given, as different incentive schemes and other measures and exemptions granted under national regulation (for example with respect to network charges and other fees and levies) often are contradictory to this principle and prevent a level-playing field between all market participants.

Model-specific considerations from a market-driven perspective

From EER's point of view, the following considerations should be taken into account on national level, when designing the coordination mechanism for flexibility:

The **rules-based approach** may make sense in very specific local situations (e.g., in relation to reactive power needs and other non-frequency ancillary services) since market based procedures may lead to a market with oligopolistic or even monopolistic structures and very high transaction costs. On the other hand, there is a risk of unequal treatment in different EU Member States and investments in flexibility may not be encouraged if no reward/compensation/remuneration is foreseen (which may lead to undermining the ability of competition).

The rules-based approach might be helpful for imposing minimum requirements to enable flexibility in the system and providing a framework to allow and promote solutions. For example, the European Network Code on Demand Connection already establishes minimum technical requirements for the provision of certain demand response services to network operators. The European Network Code on Requirements for Generators could be seen as an enabler for generator flexibility services as they must fulfil certain dedicated technical requirements. However, this approach should not be used where a market-based or a connection agreements approach is available.

Network tariff approach: The general approach (= charging structures may be designed to encourage network users to alter their behaviour for a more efficient use of the distribution network) is in principle worth supporting. Through an appropriate network tariff structure, network users should be incentivised to use the networks as efficiently as possible.

In general, the structure of network tariffs is key when transitioning to and achieving a future-proof energy system with high shares of renewable energy, enormous flexibility needs and crucial sectors such as transport and heating and cooling being electrified and decarbonized: The network tariff structure makes or breaks new business models!

Historically, tariff structures in most EU Member States depend on the consumed volume (volumetric charges > EUR/kWh). As consumed volume traditionally was correlated with capacity, the tariff structure used to reflect the users' imposed costs to the grid. However, with the introduction of prosumers and larger peak demand requirements from e.g. electric heating and electric vehicles, costs imposed on the grid are less and less linked to consumed volume.

For example, PV systems and batteries allow grid users to react to the way electricity (which is supplied through the grid) is priced. PV enables consumers to self-produce energy and thereby lowers the net energy need from the grid, while batteries enable self-producers to regulate both their grid energy flows and capacity parameters. These developments contrast the recent past, in which network tariff design did not matter much as low-voltage consumers had few substitutes for grid-supplied electricity.

The new situation implies a challenge on historic network tariff structures in that users are not always paying the costs that they inflict on the grid, while instead socializing this cost on the grid users leading to discrimination. This may be the case for resources that are exempted from network tariffs but still impose costs on the grid through e.g. reverse flows or continued reliance on the grid in some periods (as infrastructure costs are mainly driven by the topology of the network and by capacity). On the other hand, network tariff structures which address the cost socialization problem should not prohibit self-consumption (as this is an important pillar of the future energy system!). Though, one aspect in the whole discussion should not be neglected: the grid infrastructure still needs to be financed.

In addition to the discrimination / cost socialization problem, there are other challenges which need to be addressed in the network tariff design discussion:

In terms of sector coupling and electrification (> transport; > heating and cooling), high volumetric charges discriminate the use of electricity against oil and gas. There is a systemic disadvantage in price which hampers the electrification of those sectors and thereby, prevents decarbonization.

In terms of flexibility, high volumetric charges can also be problematic as they prevent increased consumption which for example could help to absorb electricity in times of oversupply by renewable energies (for example heating water with electricity). Rigid fixed capacity charges can also pose challenges to flexibility needs. In Germany for example, those providing demand-side flexibility may face higher network tariffs as the regime is incentivizing consumers to maintain a flat consumption profile, often removing any business case for demand response.

A well-designed tariff structure should stimulate the development of flexibility instead of blocking it. Needless to say that the magic silver bullet has not been discovered yet and there is a strong need to further investigate the development of “smart” network tariff options.

Some words of caution though, regarding the often praised “dynamic” network tariff approach where DSOs send (close to) real-time price signals to network users, incentivizing them to modify how and when they use the network depending on the current state of the network. This form of network tariff approach encounters the following disadvantages:

- Dynamic network tariffs may quickly conflict with market price signals.
- A high effort on part of the DSO would be needed in order to implement, process and handle dynamic network tariffs (in particular challenging for smaller DSOs).
- This approach would also result in high transaction costs for market players.
- Customers would be confronted with high insecurity in terms of predictability and calculability of network tariffs.
- The parameter setting for dynamic network tariffs would be extremely difficult.

Overall, more work is needed to determine ideal combinations of tariff structure elements (i.e., tariff basis > volumetric vs. capacity based, timing, direction, and location) which can provide solutions to the problems discussed above. Also, it will be crucial to allow for sufficient room to take national specificities into account when deciding on what will be the most favourable network tariff design in different situations.

Connection agreements approach: In our understanding and most generally speaking, flexibility on the distribution level means the ability of market parties (energy supplier, service provider or independent aggregator) to manage the customer's consumption and generation (including the customer's participation in wholesale and balancing markets) while following reasonable restriction requirements set by the DSO in accordance with the local network situation at the point of interconnection with the electric grid. Those restriction requirements should be based on congestion forecasts and should be defined very narrowly. The restriction requirement limits the possibility to use the electric grid compared to the technically possible capacity at the point of interconnection with the local distribution grid, thereby reducing the degree of freedom for using the electric grid by the network user (= end consumer).

If network users accept any restriction requirements leading to limited access when the network is constrained, they should receive some form of reward (i.e., financial incentive) in exchange for following those restriction requirements. A reduced connection cost in exchange for following restriction requirements set by the DSO could be such form of reward. Reduced network tariffs could be another form of reward. Other financial incentives such as direct payments are a third reward option. All three options are feasible and depend to some degree on national regulatory frameworks already in place.

Generally, we envision two levels of participation: Network users (= final customers) that follow restriction requirements set by the DSO during certain time periods at the point of interconnection with the electric grid. In exchange for following those restriction requirements (= offering their flexibility to the DSO), they receive some form of reward. On the other hand, there are network users that do not follow any restriction requirements. They can always use 100% of their technically available capacity at the point of interconnection and don't receive any kind of reward. It is important that participation by customers is voluntary, not obligatory.

In addition, it should be stressed that the DSO never should be in charge of directly operating the customer's flexibility, unless there is a network emergency. Operation and management of flexibility should always be carried out by the customer's energy service provider (e.g., his energy supplier or an independent aggregator) while following certain restriction requirements set by the DSO (= limited access when the network is constrained).

Furthermore, it is crucial that all customers are treated equally and in a non-discriminatory manner. In this respect, we would like to raise some caution with this approach, as there is the danger of special contractual arrangements which could give an advantage to certain individual customers or flexibility providers (especially the ones that are associated enterprises).

In general, EER is extremely sceptical of bilateral contractual agreements between DSOs and customers (= end consumers). Such an approach is always distorting competition and hindering other market participants in operating the customer's flexibility. In addition, there is quite a high potential for misuse on part of the DSO. Especially by smaller, not fully unbundled DSOs that could give a competitive advantage to affiliated business divisions. (Effective monitoring and enforcement control is problematic with a high number of DSOs, as is the case in Germany – 800 out of 900 DSOs are not fully unbundled and below the threshold of 100.000 connected customers.)

Most important to this approach is that the limitations to grid access are transparent and predictable for grid users, or their service providers. Depending on the national circumstances, regulators should work together with DSOs to establish general criteria that the DSO should follow when designing and implementing this kind of approach.

Market-based approach: Provided that locally, there is sufficient availability (in numbers and volume), market-based procurement can deliver cost-efficient and innovative solutions driven by competition for the provision of services. There are several options to implement such a market mechanism, e.g. via competitive tender schemes or a market platform.

From an energy system perspective, flexibility market platforms can provide a mechanism to integrate renewable, storage and other sources of flexibility in the energy system or to improve their utilisation for the system. They may be a vehicle for trade of flexibility at local/distributional level and they may offer visibility on multi-layer trading of flexibility products at local, regional and national levels.

With their report on Flexibility in the Energy Transition published in February 2018[2], the four Brussels-based Associations representing DSOs (CEDEC, EDSO for Smart Grids, Eurelectric, and Geode) have provided valuable input into the overall discussion on developing flexibility market platforms. The outlined product requirements and specifications for aligning existing markets, such as balancing services with congestion management services, provided a first comprehensive overview on all the questions and challenges which need to be tackled during the development phase of these new market places.

Also, the presented overview of the three different procurement options possible for congestion management (those are: *1. Separate TSO & DSO congestion management; 2. Combined TSO & DSO congestion management; 3. Combine balancing bids and congestion management*) is advancing market design discussions significantly. From a market-driven perspective, the finding that any market place for congestion management by the DSO should be integrated in the current balancing and congestion management markets for TSOs can only be supported. Congestion management on DSO networks must be coherent with TSO management of congestion and balancing as the same flexibility resources will provide these services to network operators.

Currently, several aggregation models and flexibility market platforms on the distribution level are being trialled. Though, all these pilots are in early stages and none has become a national standard yet. In addition, with a significant number of pilots (and many different variations) there is the risk to end up with a very complex and costly trading platform landscape. Independently designed algorithms running on these platforms may, if not synchronized “by design”, impact TSO-DSO coordination and data exchange negatively.

In some Member States competitive platform based procurement on the distribution level may be a more distant target model (= long-term vision) that cannot be implemented immediately as there are too many obstacles that would have to be overcome at present. One problem right now for example is the very limited liquidity available and the need to activate many local flexibilities that have not been incorporated in the broader energy system yet, but are just used for self-optimization. Also, installing smart meters capable of two-way

[2] CEDEC, EDSO for Smart Grids, Eurelectric, GEODE (2018): Flexibility in the Energy Transition – A Toolbox for Electricity DSOs

communications and providing close to real-time data on a broad scale as well as installing and implementing the required management and control software will have to be handled first. Particularly challenging in this context is the development and implementation of interoperability standards, such as use of application programme interface (API) or general electronic data interchange (EDI) layer for example.

Key Recommendations

- DSOs should definitely be encouraged to use flexibility to solve capacity constraints on the local distribution network and to avoid or defer reinforcement, if this is the most efficient option.
- At the same time, a clear framework which is setting the conditions and boundaries on how the DSO is allowed to use flexibility is needed in order to keep market mechanisms functioning.
- There are two important pre-conditions that need to be fulfilled for DSOs to be able to use flexibility: First, DSOs need to be fully unbundled and second, DSOs need to have a solid network structure at their disposal, including sufficient knowledge about the status of their network. This includes enhanced monitoring and control technologies to manage the network and provide data of network quality on the distribution level.
- As a basic principle, network users should be able to take their own decision on how to provide flexibility services to either DSOs or the energy market.
- All sources of flexibility that benefit the grid, including generators, storage and demand side response, should be treated in a non-discriminatory manner when procured by network operators. Regulatory incentives should avoid any bias towards specific technologies that deliver flexibility.
- The parallel existence of different models which enable DSOs' access to flexibility (or the combinations of models) will lead to system inefficiencies, high transaction costs for market participants and limited market liquidity. Therefore, we strongly recommend the implementation of one coherent framework.
- Nonetheless, transitioning from less sophisticated arrangements to market-based platforms, as they get developed over time, should be possible.
- Any range of models needs to be kept as lean as possible.
- Besides DSO-TSO coordination, which is vital, there is also a need to include other affected parties into any discussion on further developing the framework for flexibility use on the distribution level, such as flexibility providers. This collaboration is needed to be able to look at issues from different angles and make use of relevant expertise to achieve the most efficient outcome.