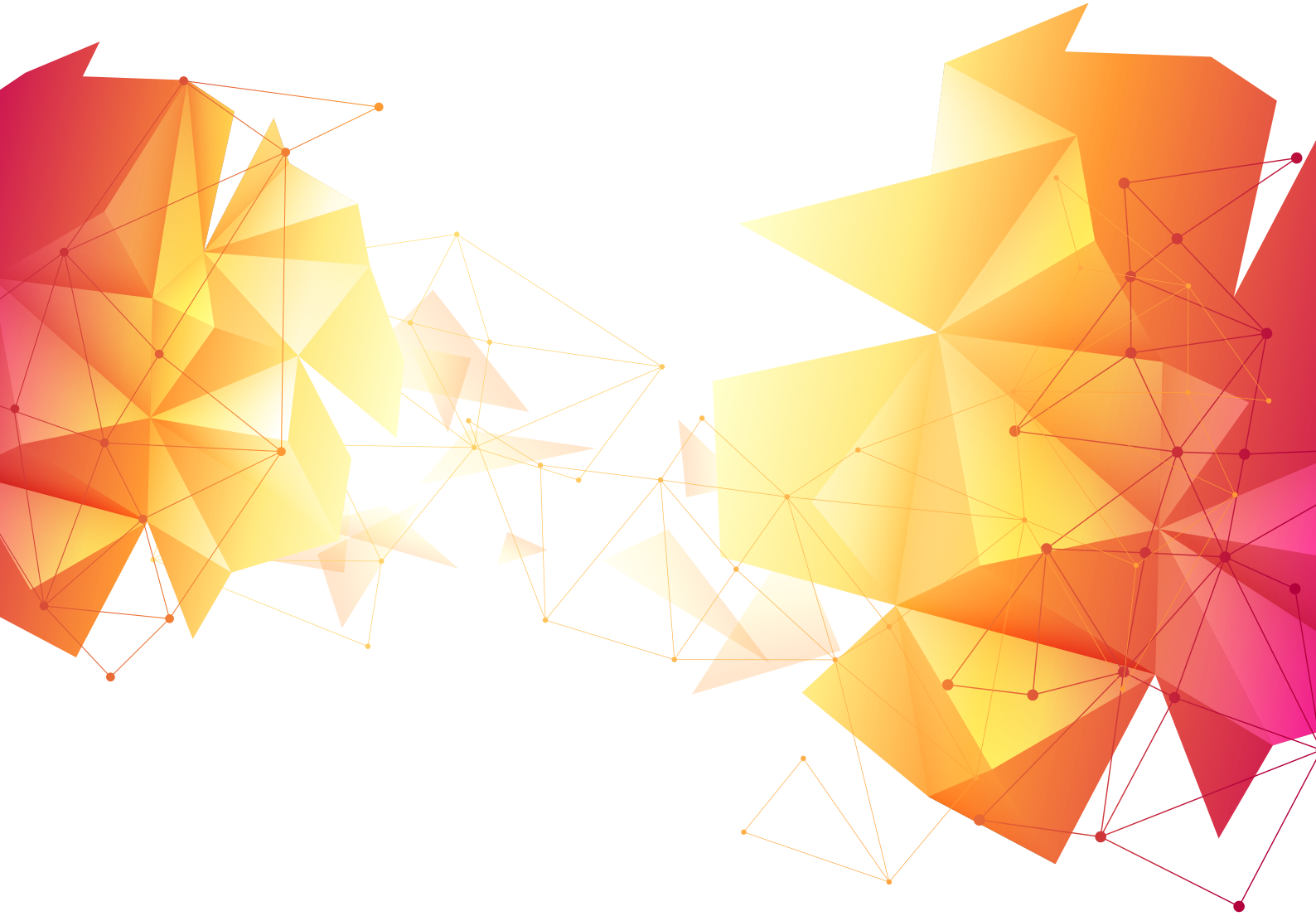
GENERAL GUIDELINES FOR REINFORCING THE COOPERATION BETWEEN TSOs AND DSOs

- The intention of this paper is to guide both DSOs and TSOs in their interaction. TSOs and DSOs understand that, as part of the energy transition, their relationship will intensify in the coming years. The paper identifies areas of common action.



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NEW CHALLENGES FOR TSOs AND DSOs

With the growth of renewables, the increased interconnection of European grids, the development of local energy initiatives, and the specific requirements on TSO–DSO cooperation as set forth in the different Network Codes and Guidelines, TSOs and DSOs face new challenges that will require greater coordination.

For TSOs, the central challenge now and in the future will be maintaining overall system security via frequency control, LFC block balancing and congestion management (across borders and on the TSO level) and voltage support in the transmission network in an electricity system in which an increasing share of power generation (often non-synchronous) takes place at the distribution level. Meanwhile, this shift towards smaller-scale, distributed generation has landed DSOs with another challenge: managing voltage stability and congestion on their grids.

To solve their respective challenges in a cost- and resource-efficient way, both TSOs and DSOs will rely upon access to a common set of supply and demand side resources. Ensuring coordinated access between TSOs and DSOs to this limited pool of assets is essential for enabling TSOs and DSOs to fulfil their missions in a manner that minimises societal cost and maximises sustainability and security of supply of our power system.

Essentially, the upcoming opportunities for the TSO and DSO cooperation can be grouped into three categories: (1) coordinated access to resources, (2) regulatory stability and (3) grid visibility and grid data.

1. Coordinated access to resources

- The use of resources for TSO and DSO purposes needs to be better coordinated.
- When decisions are made on the TSO side, the side effects on the DSO side (and vice versa) need to be taken into consideration to avoid a lack of resources for alternative purposes or in induced grid issues on another network.

2. Regulatory stability

- Changes in policy and regulatory frameworks need to be transparent, predictable and coherent to reduce the risk of inefficient investment decisions.
- Regulatory regimes and principles in the field of transmission and distribution grids should incorporate coherent approaches and timescales and be coordinated to enable TSOs and DSOs to manage their networks in an optimal way.

3. Grid visibility and grid data

- TSOs and DSOs should receive sufficient data (e. g., grid user data) to monitor and operate their grids efficiently. Given the additional requests of observability, granularity and transparency of data expected by policy-makers, data gathering requires improvement.
- TSOs and DSOs should receive sufficient information from each other.

BENEFITS OF ENHANCED COOPERATION BETWEEN TSOs AND DSOs

Solving these issues will require further effort from DSOs and TSOs, but it will eventually bring benefits to all players in the energy value chain. The positive experience from existing national cooperation should be taken into account in this work.

Customers should enjoy at the lowest possible cost a high quality of service (frequency, harmonics, voltage, etc.) and security of supply, and consequently will place more trust in TSOs and DSOs and in the energy industry as a whole.

For market parties, a coordinated strategy between TSOs and DSOs would facilitate the participation of flexibility sources in all markets (including TSO and DSO requirements) and ease the integration of Distributed Energy Resources (DER) and Demand Side Response (DSR) through better control and monitoring.

From a decision-making process perspective, cooperation would have many advantages because integration can lead to better decision-making and therefore lower costs. Streamlined connection processes could make the relationship between TSOs or DSOs and grid users easier.

In the specific case of grid planning, an appropriately coordinated approach to system development by TSOs and DSOs can optimise grid development costs. It could also contribute to reducing electrical losses and lead to an economic optimisation of grid reinforcements and renewals. Last but not least, it would simplify access to all resources within the grid and enable efficient long-term use of resources.

WHAT AREAS REQUIRE ENHANCED COOPERATION?

To turn this vision into reality, TSO and DSO experts have proposed a set of preliminary guiding principles regarding the division of roles and responsibilities between TSOs and DSOs, cooperation at operational level (e. g., network planning, system operation, reactive and active power management) and market arrangements.

As a general principle, TSOs and DSOs should try to follow a system [1] approach to find the best solutions within the perimeter of each system operator for local problems (such as voltage control) and through a cross-network approach, keeping in mind the TSO–DSO interface, for problems with cross-system impact (such as system balance).

ROLES AND RESPONSIBILITIES

TSOs and DSOs have different roles and responsibilities in different countries as both neutral market facilitators and grid managers. TSOs are responsible for overall system security via frequency control, LFC block balancing and both congestion management and voltage support in transmission network. As grid managers, both TSOs and DSOs are responsible for the secure operation of their respective networks, which involves managing congestion and voltage on their grids. TSOs and DSOs both have an important role in providing information and support to the electricity market participants, each at their respective level. They act as neutral market facilitators

1) The power system includes all supply, demand and networks and all related parties, from utilities to customers.

when they are providing different services to the market participants: connection of users and grid access; supplier switching, when applicable; activation of flexible resources; communication of public data to market participants (e. g., suppliers, aggregators, ESCOs, producers) and public authorities, etc. All these tasks need to be performed in a transparent and non-discriminatory way, so neither DSOs nor TSOs should be active as commercial service providers.

TSOs and DSOs are both in charge of congestion management and voltage management for their respective grids. In addition, TSOs are usually in charge of balancing and frequency control.

Prospective roles can also be given consideration. For instance, in the medium to long term, DSOs may resort to local islanding when an MV line is disconnected from the system to maintain the quality of service before reconnection to the system.

FLEXIBILITY IN THE MARKET

The same flexibility sources (demand and generation) can match different needs, and therefore have potentially conflicting uses between:

- system balancing between supply and demand (energy markets and flexibility); and
- network management (congestion management and voltage control).

The procedures for congestion management at the transmission level are already well established, but they should also be developed at the distribution level and integrated with other aspects of the current market design at that level. Market parties should be able to access all markets on a voluntary basis. Selection of bids should be based on technical and economic optimisation.

Congestion management and system balance products can be classified into two categories:

- long-term products (curtailment contracts). The time frames could be yearly or monthly; and
- short-term products. The time frames could be weekly, daily, hourly, close to real time/by the minutes.

All market parties with active power flexibility should be able to bid into different markets:

- energy markets (forward, day-ahead, intra-day and balancing energy markets); and
- local congestion markets: long-term bilateral contracts or short-term congestion markets between TSOs/DSOs and grid users to solve local congestions. As an example, such contracts may be associated with mandatory bidding in short-term markets for congestion management, possibly at predefined conditions. Such provisions should not prevent flexibility sources from bidding in other markets or compromise the balancing of the overall system.

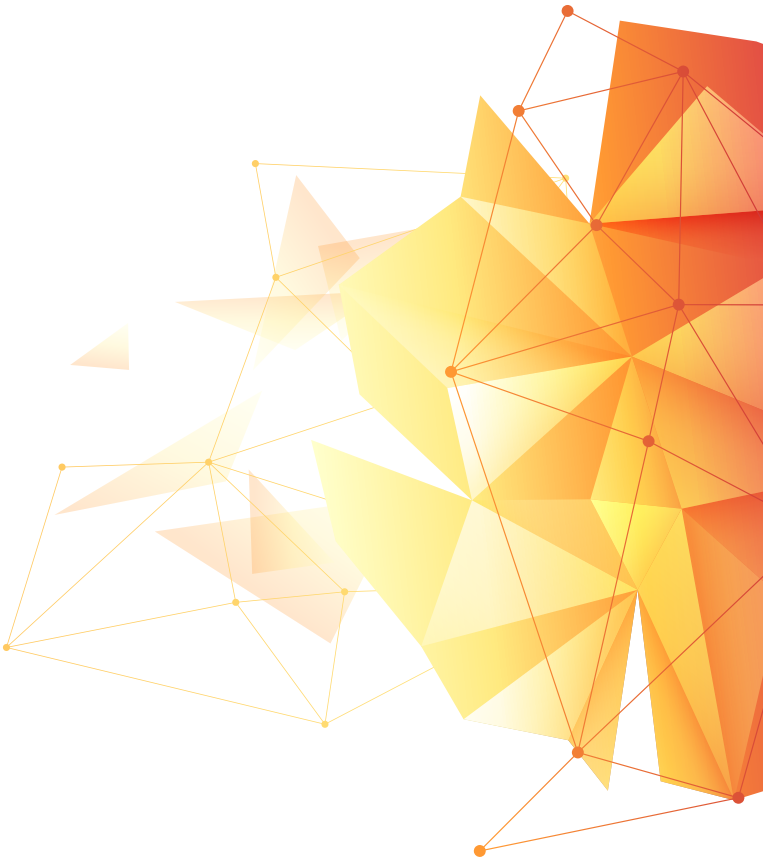
To enable this:

1. it is very important to determine how flexibility is measured. For this, a baseline calculation method might be developed;

2. DSOs and TSOs could investigate possible options for coordinating the use of flexible resources. Among these options are:

   - single marketplace: full integration of bids for balancing and congestion management. Possible solution: marked bids/DSO or TSO tag when geographical information is included. Should this option be chosen, this market design and management should be handled by TSOs in close coordination with DSOs; and
   - local congestion markets: these would feature a local market for congestion management operating with a high level of coordination between TSOs and DSOs and in coherence with existing markets (forward, day-ahead, intra-day and balancing energy markets) to, e. g., avoid double bidding, guarantee security and global optimization; and

3. TSOs and DSOs should be able to use reactive power from renewable sources to support voltage levels.



TECHNICAL REQUIREMENTS

For active/reactive power management, DSOs and TSOs should:

- carry out integrated T/D grid analysis at regional level to minimise long-term costs;
- maintain the freedom to jointly implement a (mutually agreed-upon) tailored approach; and
- be able to select the best solutions for solving local challenges (TSO-DSO-DER).

Regarding network planning procedures, DSOs and TSOs should:

- exchange DER forecast to optimise power flows at the T/D connection point and work together to increase public acceptance of network construction projects;
- work together in defining technical requirements for new technologies and ancillary services; and
- align network planning at the TSO/DSO interface.

Last but not least, for system operation, DSOs and TSOs should:

- develop information and data exchange and agree on common procedures to doing so;
- work together in defining mandatory assistance procedures (cascading principles between network operators); and
- coordinate real time congestion management procedures (short term) with integrated markets.

HOW TO GET THERE?

TSO-DSO understanding and knowledge sharing

DSOs and TSOs should:

- set up a structured meeting platform on DSO and TSO European associations' level, including joint working groups, to gain a better understanding of each other's needs and challenges, agree on common objectives and find common solutions for different issues as outlined above. A project team will further specify roles and responsibilities;
- identify together, at an early stage, new technologies (e. g., communication tools, protocols, etc.) that could improve the interactions between TSOs and DSOs; and
- establish joint staff training.

NRA engagement

NRAs should:

- allow the use of flexibility for local and central market purposes and allow TSOs and DSOs to access flexibility resources in a coordinated way;
- enable TSOs and DSOs to contract with flexibility resources for local congestion management and have access to all information they need. This could be achieved, among other options, through bilateral contracts between TSOs/DSOs and resources (full network access/variable access contracts);
- facilitate means of dealing with constraint management for issues caused by the actions of parties with whom the DSO or TSO has no direct involvement; and
- acknowledge and approve techno-economic optimal solutions defined by the TSO and DSO. This entails creating an appropriate framework, incentivising TSOs and DSOs to choose the right balance between network investment (long term), congestion management contracts (long term/medium term) and real-time congestion management (short term).

At the EU level:

- the European Commission should mandate the European Standardisation Organisations to support the implementation of network codes. These standards shall be implemented in line with and supporting the network codes; and
- in the future, the EU network codes should be monitored and periodically reviewed to ensure that they reflect system needs.