ΡΥΘΜΙΣΤΙΚΗ ΑΡΧΗ ΕΝΕΡΓΕΙΑΣ
REGULATORY AUTHORITY FOR ENERGY

REGULATORY REVIEW FOR THE CO-ORDNINATION OF TRANSMISSION AND DISTRIBUTION SYSTEM OPERATORS

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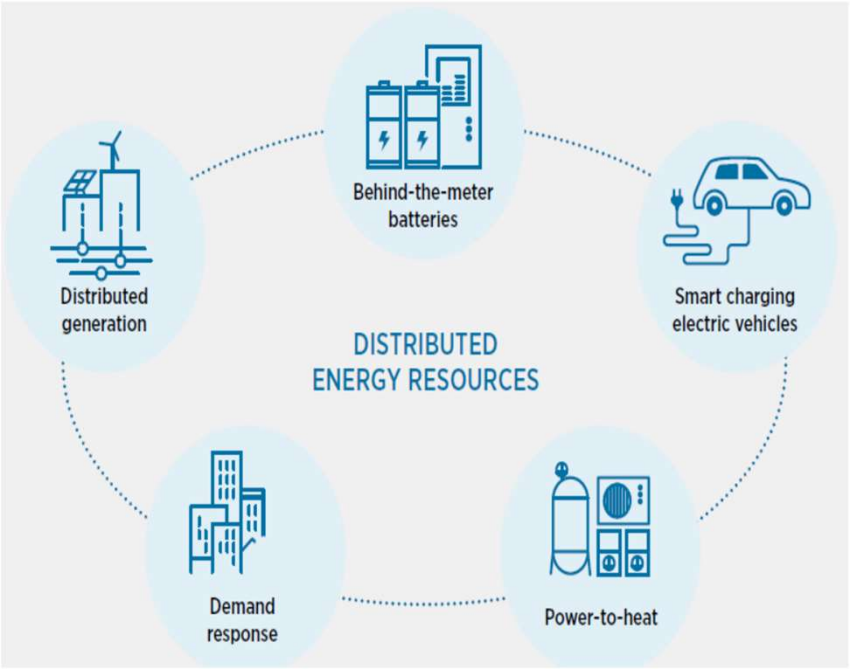
DISTRIBUTED ENERGY RESOURCES

Distributed energy resources (**DER**) are small or medium sized energy resources directly connected to the distribution network (EC, 2015).

- Distributed generation
- Energy storage (small scale batteries)
- Electric vehicles
- Heat pumps
- Demand response

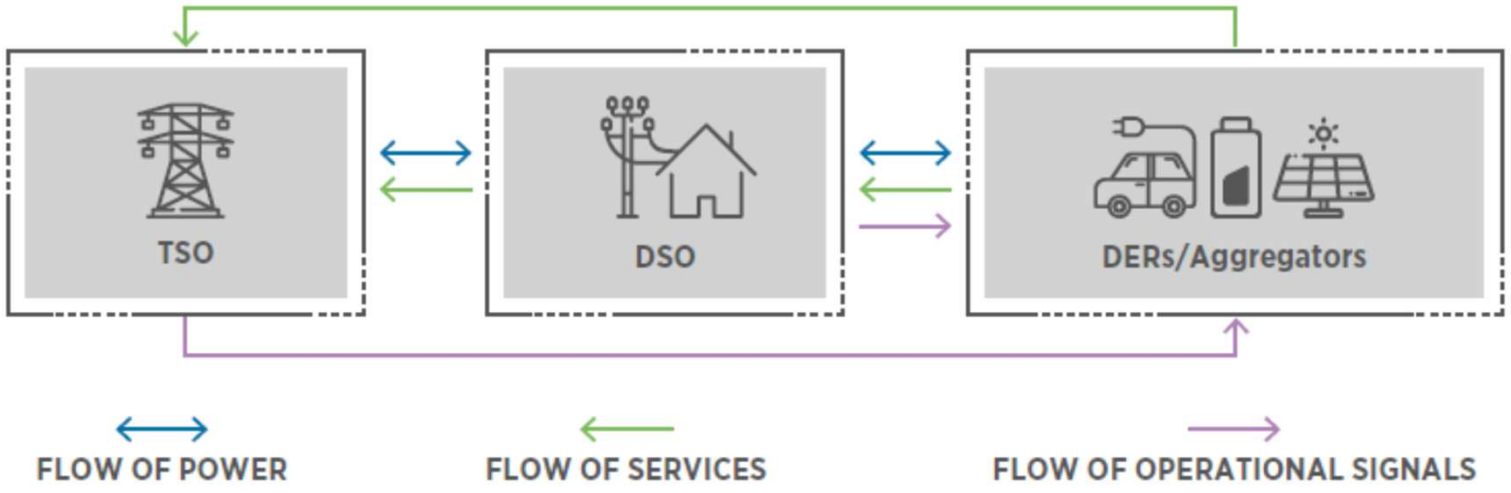


THE NEED FOR COORDINATION

- The deployment of **renewable generation technologies** connected to the distribution network has resulted in the **bi-directional flow** of electricity through the network.
- In addition, the emergence of **distributed storage and demand response** practices has also changed the net load and flows in the system.
- In this new context, with the deployment of DERs, **the role of the DSO needs to expand** to harness the flexibility offered by these new technologies on the distribution system. If the regulatory framework allows it, DSOs can themselves operate the DERs, or they can act as neutral market facilitators and provide **high-resolution price signals** to the market players that own flexibility assets, supporting the TSOs.
- **The roles** of, **and interaction processes** between, DSOs and TSOs need to be **redefined** to increase the integration of DERs within the power system.

INTERACTION MODEL

Interaction model between system operators and DERs



Source: Adapted from Birk et al. (2017).

IMPORTANT AREAS OF COORDINATION

- Definition of data that need to be exchanged: network development, demand and generation forecast, ancillary services, energy markets, load shedding and capacity markets
- **Data on DER** type, characteristics and capacity, their production and consumption profiles
- Exchange of system **planning** information and **development** of simplified system models
- Conduct and co-ordinate technical studies **to assess constraints** in the system
- Co-ordination on **congestion management**

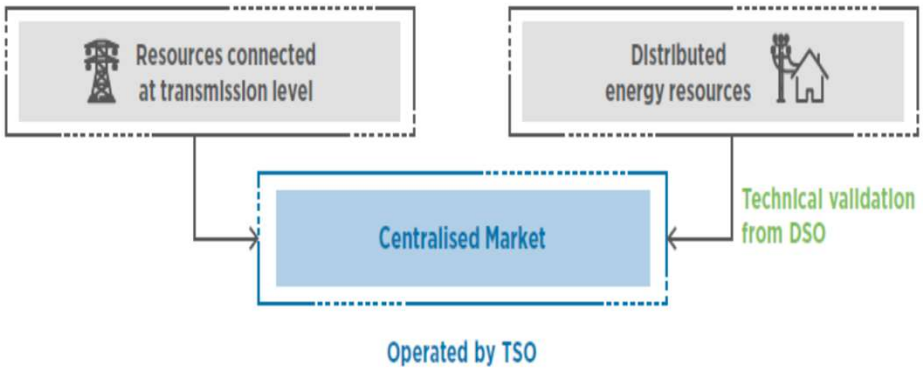
IMPORTANT AREAS OF COORDINATION (cntd)

- Definition of **grid connection requirements** for grid users and renewable power plants
- Exchange of information on **available network capacity** and grid hosting capacity
- Whether connection of new generation to be at transmission or distribution level
- Definition **of system operation network codes**
- Co-ordination on protection and restoration schemes

1. CENTRALIZED ANCILLARY SERVICE MARKET MODEL

DESCRIPTION

A common market for ancillary services for both resources connected at transmission and distribution level, procured by TSO.



BENEFITS

- Optimal scheme if distribution networks do not experience significant congestion.
- A single market has low operational costs and allows standardised processes.
- Easier to implement under current regulatory frameworks.
- Easiest computational complexity as only the transmission grid is considered.

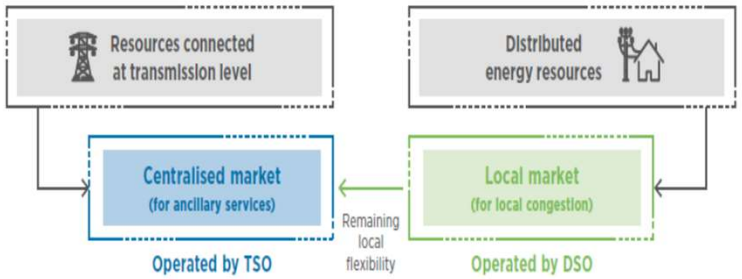
CHALLENGES

- Distribution grid constraints are not always respected

2. LOCAL ANCILLARY SERVICE MARKET MODEL

DESCRIPTION

Separate local flexibility market for DSOs, in addition to the ancillary services market for TSO procurement.



BENEFITS

- DSO has priority to use local flexibility.
- DSO actively supports ancillary service procurement.
- Local markets can have lower entry barriers for small scale DERs.

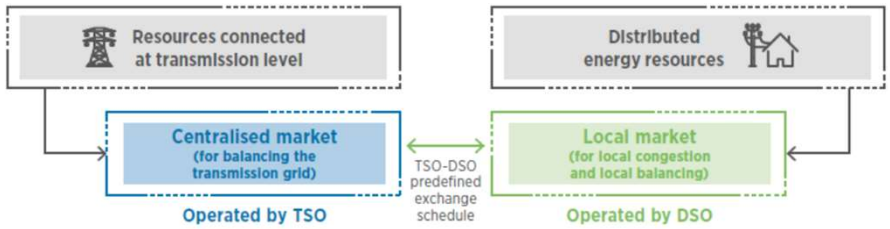
CHALLENGES

- Centralised and local market cleared sequentially.
- Need for extensive communication between the centralised market and the local market.
- Local market should have of a “reasonable” size and guarantee a sufficient number of actors are in competition in order to prevent scarcity of liquidity and exercise of local market power.

3. SHARED BALANCING RESPONSIBILITY MODEL

DESCRIPTION

Similar model to the local flexibility market model with **the exception that the remaining local flexibility is not offered on to TSO.**



BENEFITS

- TSO will need to procure a lower amount of ancillary services.
- Local markets can have lower entry barriers for small-scale DERs.
- Clear boundaries between TSO and DSO responsibilities.

CHALLENGES

- Defining a schedule methodology agreed by both TSO and DSO might be challenging.
- Local congestion markets should have a “reasonable” size and guarantee a sufficient number of actors are in competition in order to prevent scarcity of liquidity and exercise of local market power.
- Total amount of ancillary services procured by TSO and DSO together will be higher in this scheme.

4. COMMON TSO-DSO ANCILLARY SERVICE MARKET MODEL

DESCRIPTION

Common market for flexible resources connected at the transmission and distribution level, **with allocation of flexibility to the system operator with the highest need.**

BENEFITS

- Total system costs for ancillary services are minimised.
- TSO and DSO collaborate closely, making optimal use of the available flexible resources.

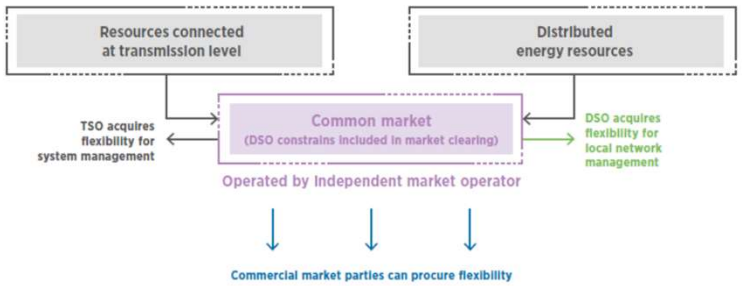
CHALLENGES

- Allocation of costs between TSO and DSO might be challenging.
- High computational complexity since constraints on both transmission and distribution grids are resolved in a single mechanism.

5. INTEGRATED FLEXIBILITY MARKET MODEL

DESCRIPTION

- Common market for flexible resources connected at the transmission and distribution level. **Both regulated (system operators) and commercial market parties participate to procure flexibility**. It is the most complex model proposed.



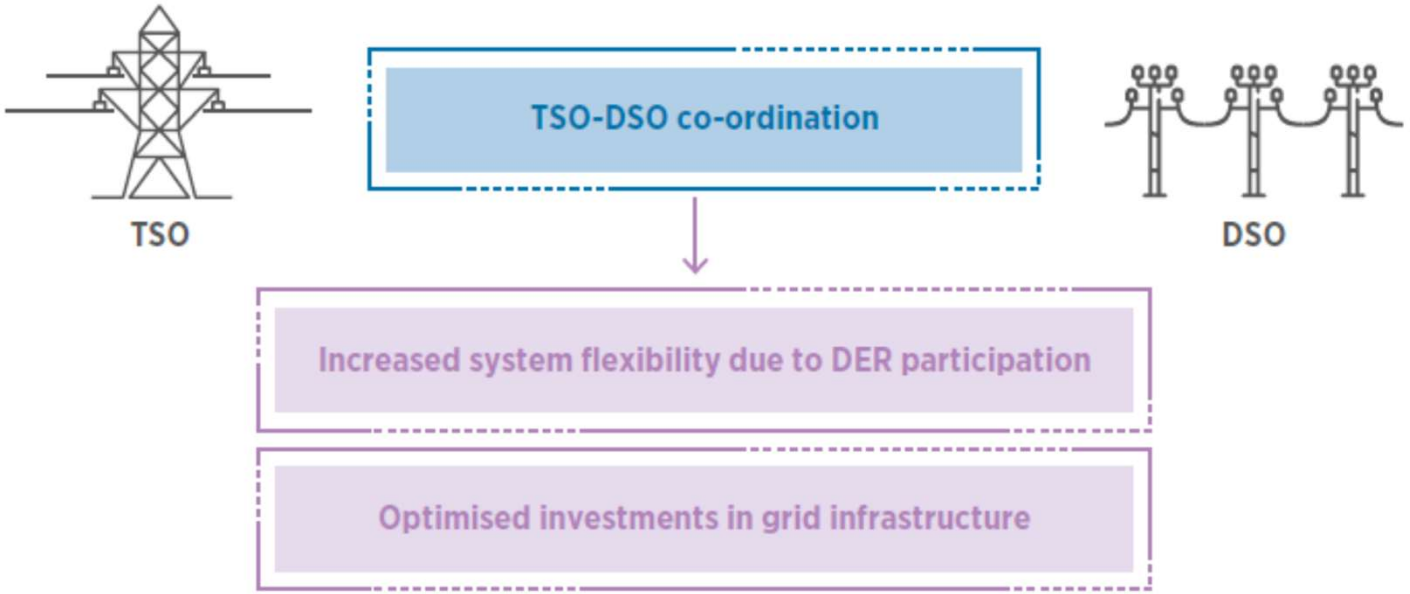
BENEFITS

- High liquidity and competitive prices due to large number of buyers and sellers.
- Increased options for balancing responsible parties to solve imbalances.

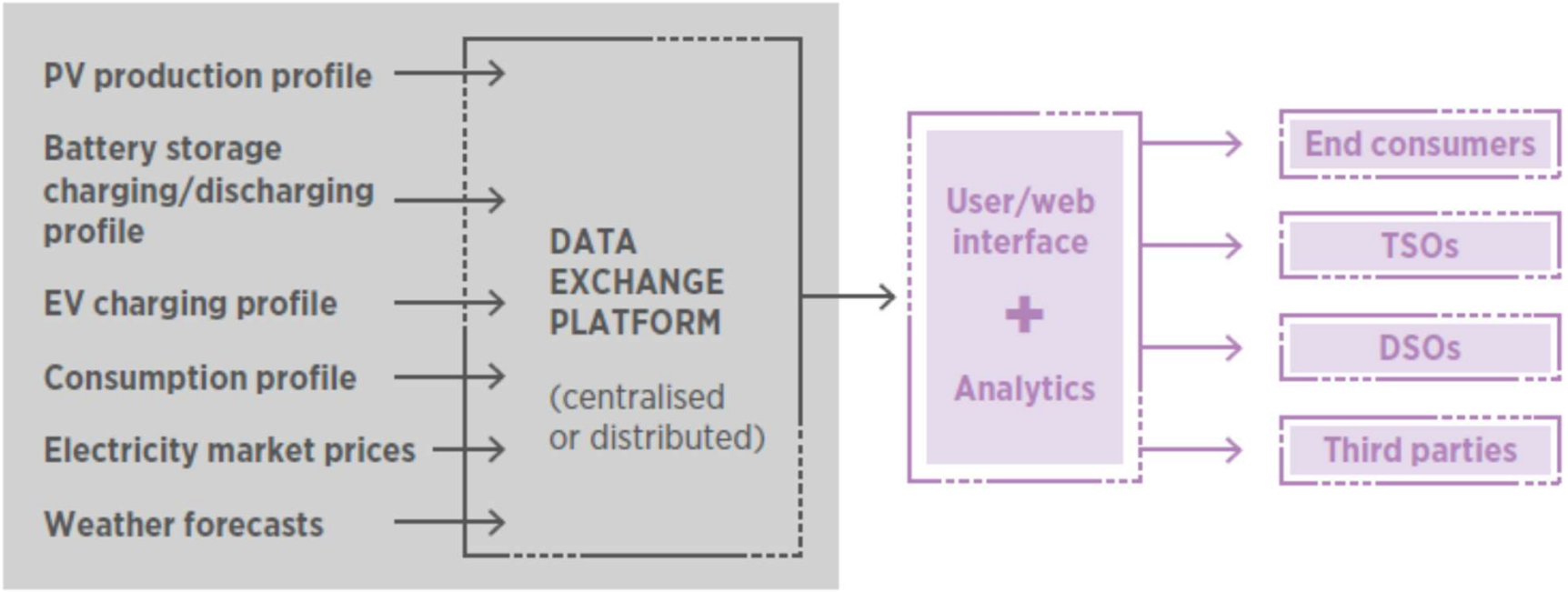
CHALLENGES

- An independent market operator needs to be established to operate the common market.
- TSO and DSO need to share data with the independent market operator.
- High computational complexity since constraints on both transmission and distribution grids are resolved in a single mechanism.

CONTRIBUTION TO POWER SECTOR TRANSFORMATION



DATA EXCHANGE PLATFORM



REGULATORY REQUIREMENTS

- Adapting the regulatory framework is key to enabling system operators to use DERs to their full potential.
- Regulators should define the roles of DSOs and TSOs to facilitate data collection, management and access for different stakeholders. Different co-ordination models are used in Europe, as presented.
- Regulators and policy makers need to ensure that DSOs and TSOs act in a **neutral and transparent manner**, enabled by data exchange platforms, communication protocols and the clear allocation of roles and responsibilities between DSOs and TSOs where these entities have **unbundled ownership**.

REGULATORY FRAMEWORK-ELECTRICITY REGULATION

The Article 53 on the Cooperation between DSOs and TSOs, highlights

- the need for data exchange,
- the need to allow DER to provide services for both the TSO and DSO.

Regarding data exchange, the legislation also details that this data exchange should serve both **planning** and **operation** purposes and should be done in the different time-steps of power systems operation.

REGULATORY FRAMEWORK-SO GL

The Commission Regulation (EU) 2017/1485 (SO GL) sets the obligation of TSOs, DSOs and significant grid users (SGUs) to exchange data to reflect the real and forecasted situation of the transmission system. SO GL left some decisions at national level. More specifically:

- Article 40.5 deals with applicability and scope of the data exchange. It has to be defined at national level and it is highly linked with the NC Requirements for grid connection of generators (RfG).
- Although KORRR (Key Organizational requirements, roles and responsibilities), set in article 40.6 of SO GL, was approved in 2019, some critical points were left to be decided at national level.
- Finally, article 40.7 of SO GL establishes the obligation that TSOs and DSOs shall agree on effective, efficient and proportional processes for providing and managing data exchanges between them.

REGULATORY FRAMEWORK-SO GL

The SOGL also establishes that TSOs and DSOs should cooperate in the case of **reserve providing units** or **groups connected to the DSO grid**. **Article 182** sets guidelines on the **prequalification process**, establishing that:

- The necessary **information exchange** regarding the providing units should be agreed between TSO and DSOs.
- The prequalification process shall rely on the **agreed timeline and rules** concerning information exchanges and the delivery of active power reserves between the TSO, the reserve connecting DSO and the intermediate DSOs. The prequalification process shall have a maximum duration of 3 months from the submission of a complete formal application by the reserve providing unit or group.
- DSOs, in cooperation with the TSO, shall have the right to **set limits to or exclude the delivery** of active power reserves located in its distribution system, based on technical reasons such as the geographical location of the reserve providing units and reserve providing groups.
- Each DSO shall have the right, in cooperation with the TSO**, to set, before the activation of reserves, temporary limits** to the delivery of active power reserves located in its distribution system. The respective TSOs shall agree with their reserve connecting DSOs and intermediate DSOs on the applicable procedures.

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Thank you. Any Questions?

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