# What about the competition for flexibility between TSO and DSO? Is it possible to perform integrated planning?

Round Table 20 - The worth of flexibility in distribution planning and operation

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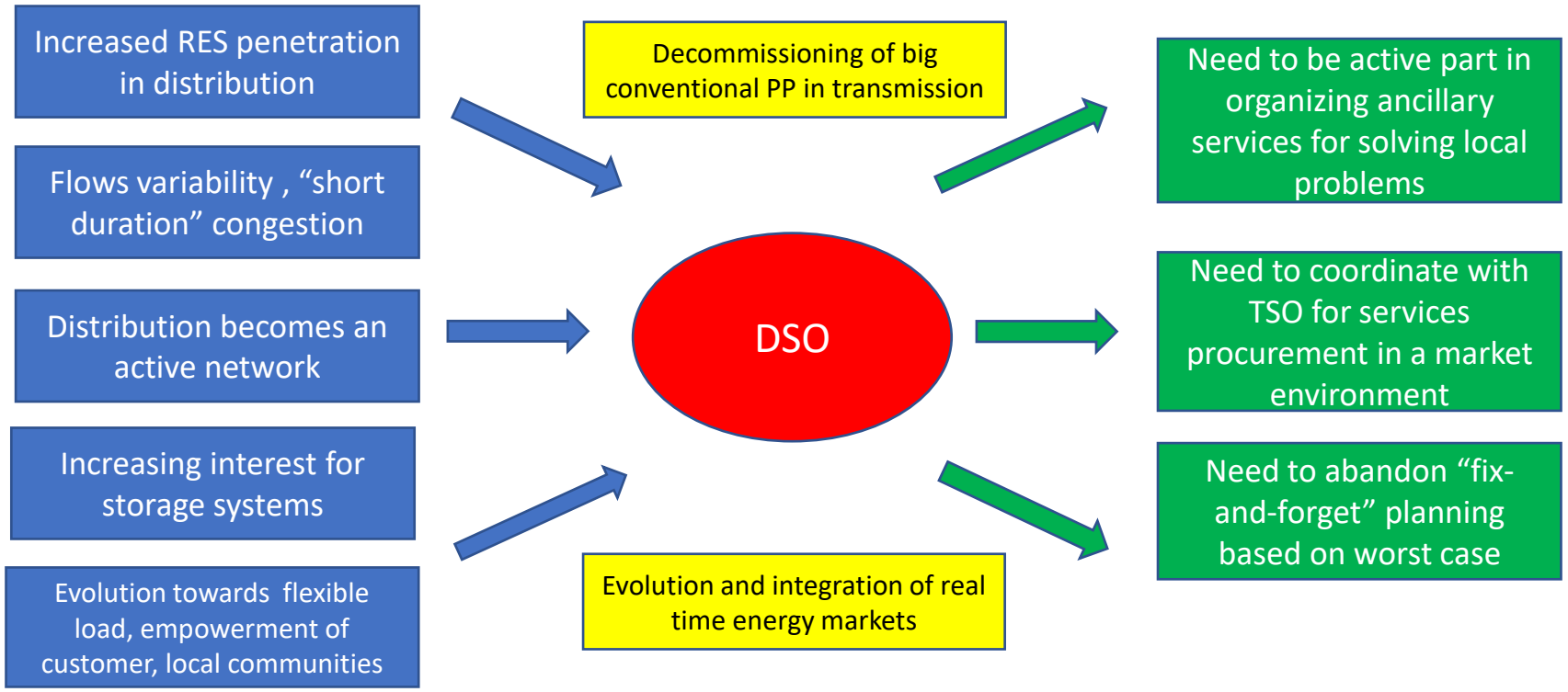
**AGENDA**

- The changing role of the DSO
- Flexibility in operation: a few reflections from the H2020 project SmartNet
- Pros and cons of an integrated T&D grid planning
- Introduction to the FlexPlan project
- The new FlexPlan approach aimed at supporting a cooperative (but decoupled) T&D planning approach
- Some conclusive considerations

# The changing role of DSO




From the Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU:

**Art.32 comma 1**

Member States shall provide the necessary regulatory framework to **allow and provide incentives to distribution system operators to procure flexibility services, including congestion management in their areas, in order to improve efficiencies in the operation and development of the distribution system**. …from providers of distributed generation, demand response or energy storage and shall promote the uptake of energy efficiency measures….

**Art.32 comma 3**

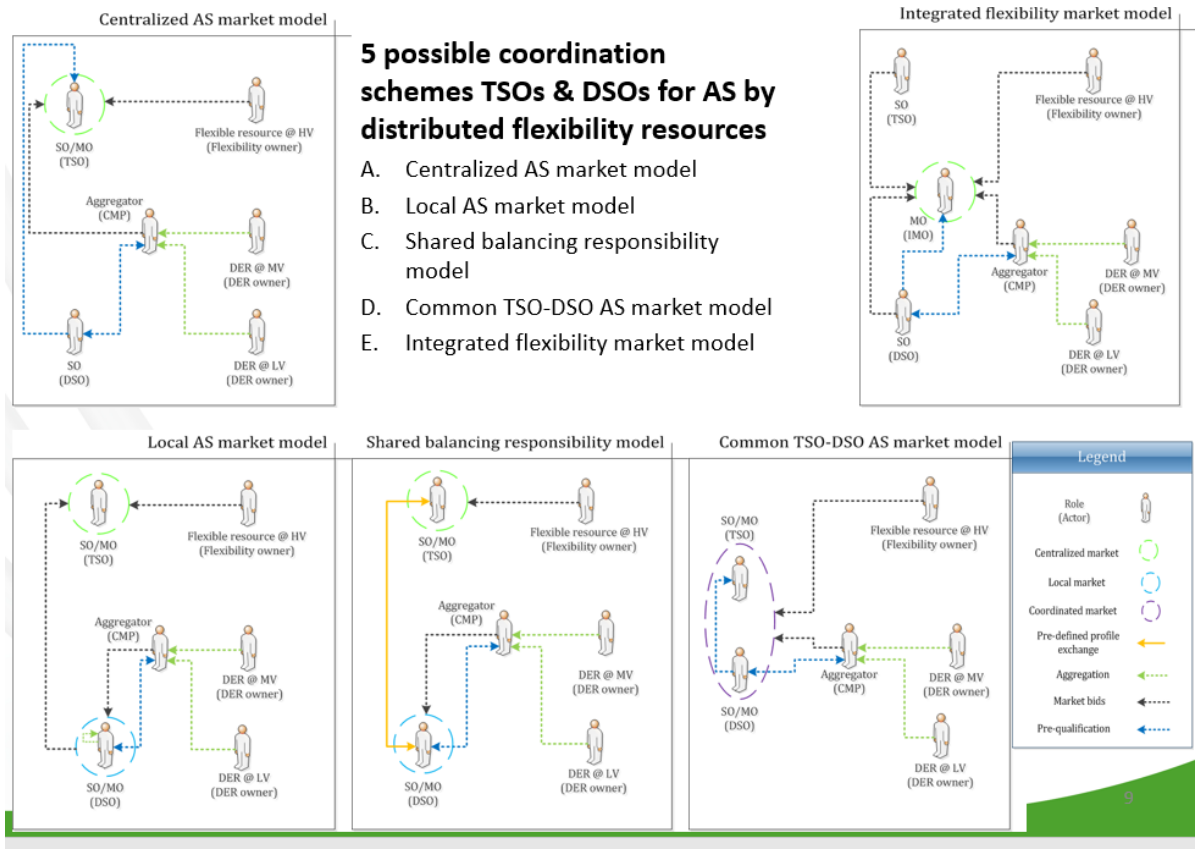
The development of a distribution system shall be based on a transparent network development plan that the distribution system operator shall publish at least every two years and shall submit to the regulatory authority. … **The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.**

# Flexibility in operation: a few reflections from the H2020 project SmartNet

SmartNet

http://smartnet-project.eu/

- **Decentralized TSO-DSO coordination schemes are usually less efficient than centralized ones** because of the two-step optimization process and of some consequent undue rigidities (e.g. imposing flow at the TSO-DSO interface).
- **Scarcity of liquidity and potential impact of local market power** (not investigated in SmartNet), along with **extra constraints introduced to avoid counteracting actions** between local congestion market and balancing market (e.g. increasing system imbalance while solving local congestion) furthermore negatively affect economic efficiency of decentralized schemes.
- **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. Small DSOs could need to pool-up.



# Integrated TSO/DSO planning: pros and cons

PROS

CONS

- Better exploitation of flexibility resources: distribution resources can provide congestion management for transmission
- Higher social welfare: higher market allocation efficiency
- Higher liquidity and reduced possibility to exercise market power

- Complicated to set up for the number of resources to consider and the number of network constraints
- Potential problems of numerical tractability
- Complexity in the management of the interface between TSO and DSO: need to set up a cooperation protocol

**It would be very profitable to enforce an integrated TSO/DSO protocol able to limit computation complexity as well as ensure a cooperation between TSO and DSO which only requests to exchange a limited amount of data.**
**Here the on-going work of the H2020 FlexPlan project is providing a possible solution.**

# Flexibility in planning: the FlexPlan project

FlexPlan

Start date: 01.10.2019

End date: 30.09.2022

**… aims at establishing a new grid planning methodology considering the opportunity to introduce new storage and flexibility resources in electricity transmission and distribution grids as an alternative to building new grid elements.**

**1 – New planning methodology** - Creation of a **new tool for optimizing T&D grid planning**, considering the **placement of flexibility elements** located both in transmission and distribution networks **as an alternative to traditional grid planning**: in particular, storage, PEV, demand response)

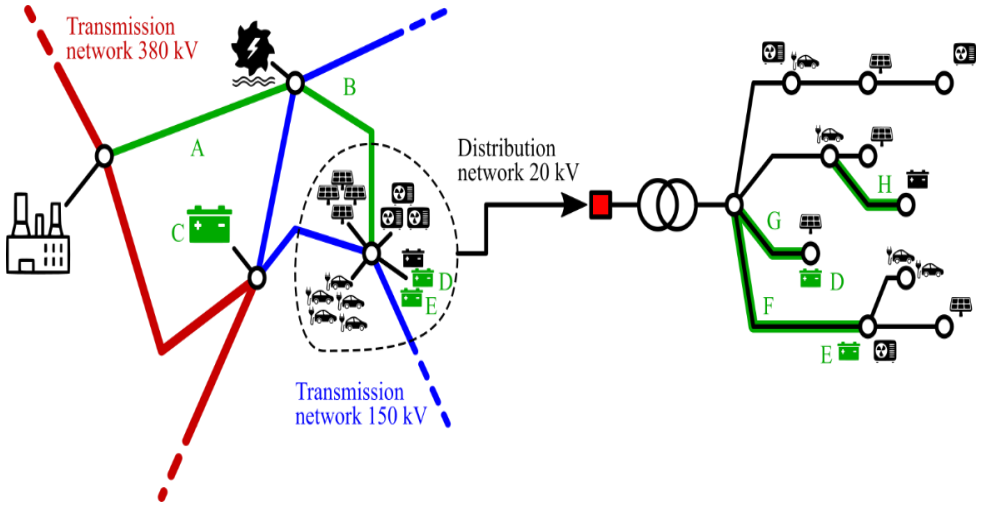

**2 – Scenario analysis 2030-40-50** - New methodology applied to analyse **six regional grid planning scenarios at 2030-2040-2050.** A **pan-European scenario** will deliver border conditions to initialize in a coherent way the 6 regional cases.

**3 – Regulatory guidelines –** FlexPlan goal is to provide:

- an optimized planning methodology for the future usage of TSOs and DSOs
- indications on the potential role of flexibility and storage as a support of T&D planning
- guidelines for NRA for the adoption of opportune regulation.


- **Research Partners:**
  - **RSE**, Italy (Project Coordinator, WP7 and WP8 leader)
  - **EKC**, Serbia
  - **KU-Leuven**, Belgium (WP1 leader)
  - **N-SIDE**, Belgium (WP3 leader)
  - **R&D NESTER** Portugal (WP5 leader)
  - **SINTEF**, Norway (WP6 leader)
  - **TECNALIA**, Spain (WP2 leader)
  - **TU-Dortmund**, Germany (WP4 leader)
  - **VITO**, Belgium
- **Transmission System Operators:**
  - **TERNA**, Italy
    - **Terna Rete Italia** as Linked third Party
  - **REN**, Portugal
  - **ELES**, Slovenia
- **Distribution System Operators**
  - **ENEL** Global Infrastructure and Networks
    - **e-distribuzione** as Linked third Party

# The new FlexPlan approach aimed at supporting a cooperative (but decoupled) T&D planning approach




The T&D grid model is decomposed into two components: meshed and radially operated networks. As the modelling of all radially operated systems would result in an unmanageable problem size, a four-step decomposition approach is chosen:

- **STEP 1:** a least-cost expansion plan of the radial network is determined with the objective of solving only local congestion in the most economical way
- **STEP 2:** a highest-cost expansion plan of the radial network is performed with the objective of providing the maximum amount of flexibility in terms of delivering and absorbing active power to/from the meshed network
- **STEP 3:** (optional) intermediate cases are analysed
- **STEP 4:** the radial grid expansion options of steps 1-2-3 are provided as expansion candidates for the meshed system, solved independently. The best trade-off is determined.

**Details in the presentation by Marco Rossi (RSE) in Session MS5.3 (22nd September – h14.30) of this CIRED 2021 edition**

# Some conclusive considerations

- Flexibility will have an ever-increasing role in the future to help coping with the increasing power injection variability of a generation park approaching 100% renewables
- Distribution network are becoming an important source of flexibility due to storage location and DSM
- The role of Distributors must change from a network management based on fit-and-forget to one in which network status is monitored and planning is accurately performed by taking into account the behavior of distributed generation and active loads as well as valorizing the role of storage.
- An integrated T&D planning could be very profitable for increasing social welfare and maximizing services availability (from distribution to transmission)
- However, there is a need to cope with numerical complexity and with the necessity to coordinate the action of two distinct subjects (TSO and DSO) so as to define a protocol allowing to minimize data exchange and grant a certain autonomy for each of them. The procedure defined by FlexPlan can be a first step in this direction.

# *Thank you…*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