Alternative for expansion

Defer the need to expand or upgrade the network until it becomes clear that it is needed

Flexibility used at the appropriate network location can help to manage congestion i.e. defer the need for reinforcement or allow quality of service to be maintained while reconstruction (reinforcement) is carried out.

Planned maintenance management

Helps to carry out planned maintenance and repair work more effectively

Flexible resources can enable more efficient and flexible maintenance planning, potentially allowing maintenance activities to be completed without the need for planned interruptions (it could, for example, avoid the use of generator sets).

Coping with unplanned interruptions

It enables the mitigation of network failures, minimising their impact on customers.

Flexibility before failure can help to provide additional resilience to the network.

Post-failure flexibility could reduce the load or allow the network to be reconfigured to reduce the impact of the failure.

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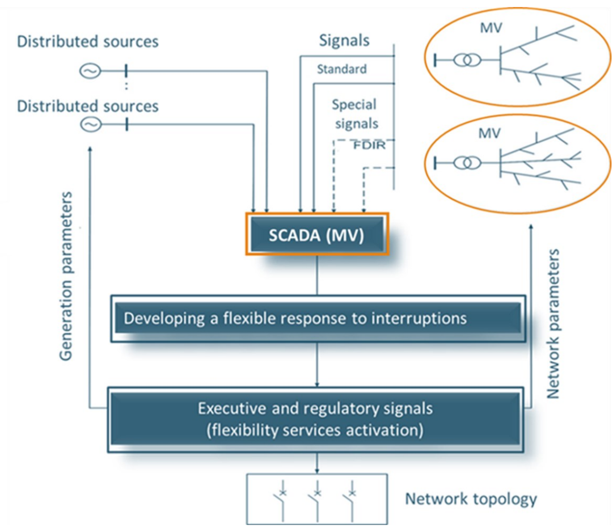
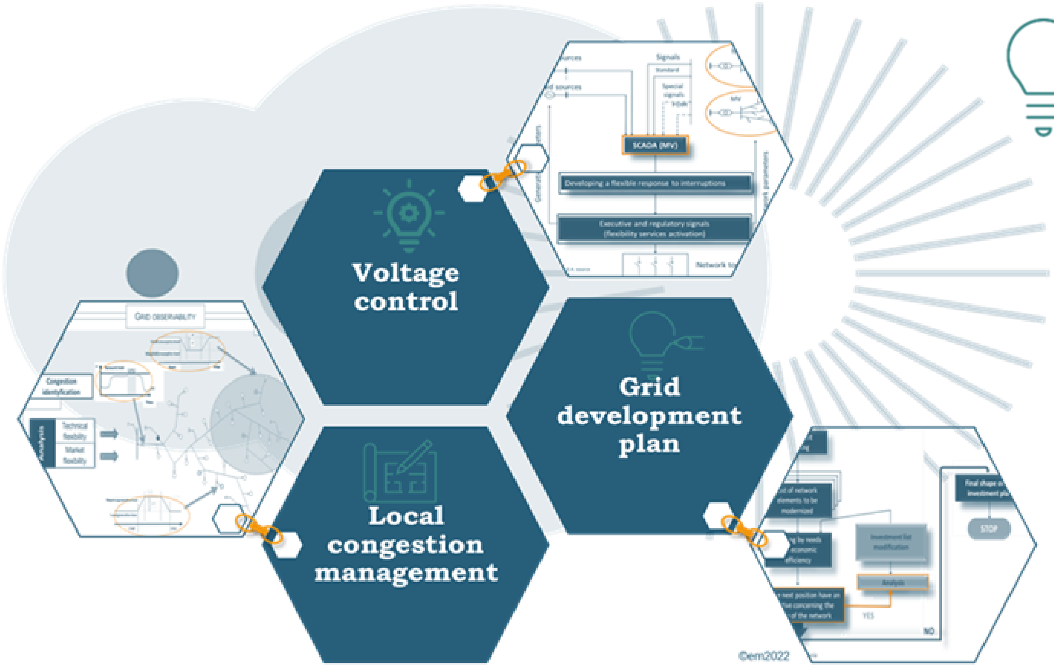
DSO Flexibility Needs

Based on the report

Grid Observability for Flexibility



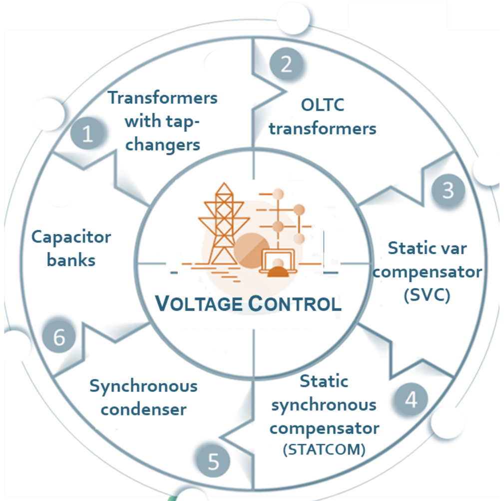
DSO flexibility needs in the power system



Voltage control

Flexibility for voltage control could be characterized as short term ability (activation timescale from seconds to minutes) to keep the bus voltages within predefined limits, a local (regional) requirement.

Generally speaking, voltage control takes place within the framework of what is known as operational flexibility (grid/technical flexibility). This means that adverse voltage variations at selected substations are monitored and, where necessary and possible, automatically regulated using existing equipment and functionalities.



Grid development plan

Flexibility for grid development plan could be characterized as medium to long term equilibrium between energy supply and energy demand, a system wide requirement for demand scenarios over time. The main reason of the need is to prepare strategy of investment planning assuming that loads on existing equipment can be flexibly adjusted to the operating conditions, and thus the process of replacing them with new ones may be postponed or the scale of modernization may be smaller than under the classical approach. The activation timescale is from hours to several years.

Local congestion management

Flexibility for local congestion management could be characterized as short to medium (activation timescale from seconds to minutes) term ability to transfer power/energy between supply and demand, where local or regional limitations may cause bottlenecks/local congestions resulting in problems with energy delivery. The main reason of the need, besides keeping stable grid during operation is to increase amount of distributed power generation in the distribution systems.

Long term: > M-1 to R and beyond

Service for congestion management considered months or years in advance. Its activation may be linked to a postponement of network reinforcement

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Technical area

The ability to manage the technical structure of the network in the most effective way, allowing to create conditions for connecting new users, while maintaining the stability and continuity of supply.

First step

Users behavior area

The ability of users to reduce or increase consumption or generation offering services to grid operators ensuring stable operation of the system; also behaviors resulting from everyday needs nad habits

Second step

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Flexibility from the power system point of view

Based on the report
Grid Observability
for
Flexibility

The term of **FLEXIBILITY** concerns the system ability to react on a current basis to any changes in both demand and supply, which theoretically could have an impact on maintaining the stable operation of the distribution system

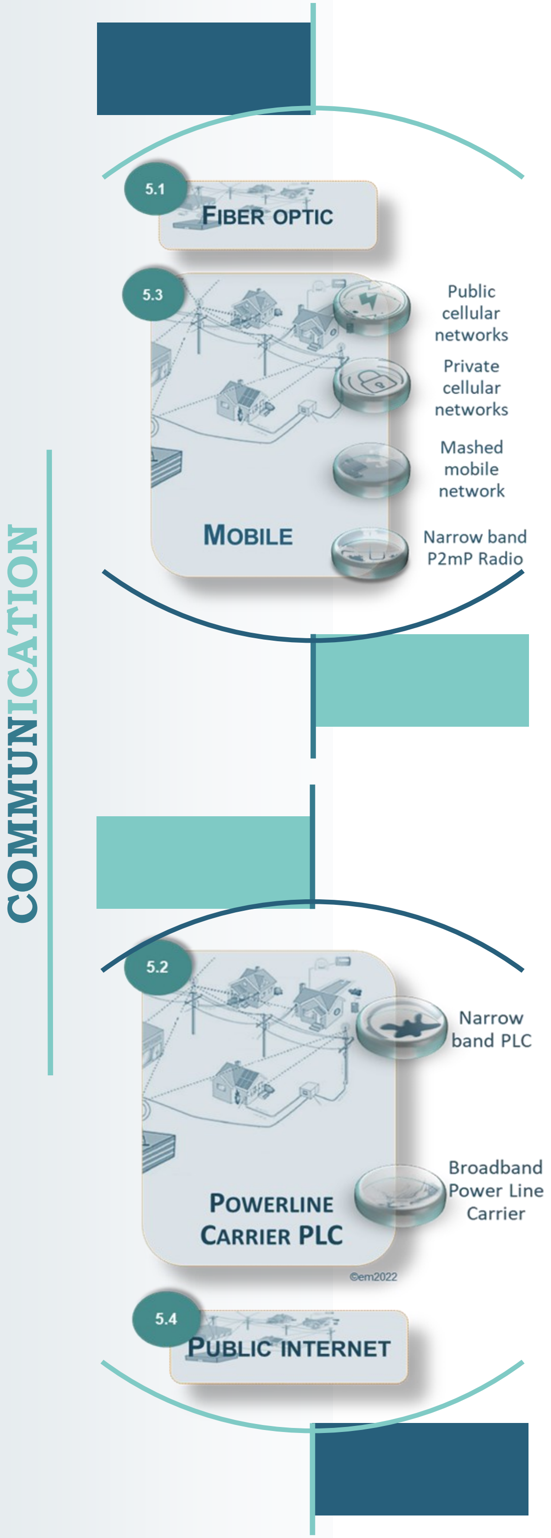
Technical (grid/operational) flexibility (network operation, congestion management and day-to-day operation) is the reaction of the system to disturbances of mainly local character (voltage, current - overload), activation by voltage and current signals (from overloaded lines at HV/ MV, use of systems commonly referred to as dynamic overload line (DOL) in the HV network) supported by communication at the operator level (automatic, or in the dispatcher mode), triggering changes in the generation schedule, generation or consumption of reactive power, changes in transformer tap changer position, network switching. This type of flexibility is a basic element in the system operation, implemented operationally in the current operation of DSOs.

Grid flexibility is closely related to the physical structure of the system and refers to the combination of used technologies.

Market flexibility (flexibility services) in the form of commercially available flexibility services offered by eligible market flexibility sources. This type of flexibility is activated at the moment when the level of operational flexibility is not able to cover the needs of the system in maintaining stable operation. This type of flexibility is complementary to the technical/grid/ operational activities carried out by the DSOs. The level of its use will depend, inter alia, on the regulations and incentives allowing the use of market mechanisms by the DSOs, the economic justification and the availability of flexibility services on the local market.

Investment and planning flexibility (network development plan) is a long-term measure which eliminates the financially rigid approach to investment planning and major overhauls of energy infrastructure (generation as well as network). There is no physical activation here, investment and development plans assume that loads on existing equipment can be flexibly adapted to operating conditions, and thus the process of replacing them with new ones can be postponed or the scale of modernisation can be smaller. This type of flexibility should take into account

The use of flexibility services by the operator is an activity that will be undertaken when the technical capacity of the network is insufficient to cope with emerging problems. Moreover, the flexibility services procurement must be economically justified and preceded by well-drafted network development plans, which will take into account, in addition to expansion and modernisation, the use of available flexibility sources if this is economically more efficient.



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DSO Grid Observability

Based on the report

Grid Observability
for
Flexibility

Observability can be defined as temporal, geo-spatial, and topological awareness of all grid variables and assets. It is also the ability for any combination of a system state and inputs to determine the system state using only measurement of system outputs. Grid observability could be called the key to reliability, resilience and operational excellence in modern distribution grids.

GRID OBSERVABILITY

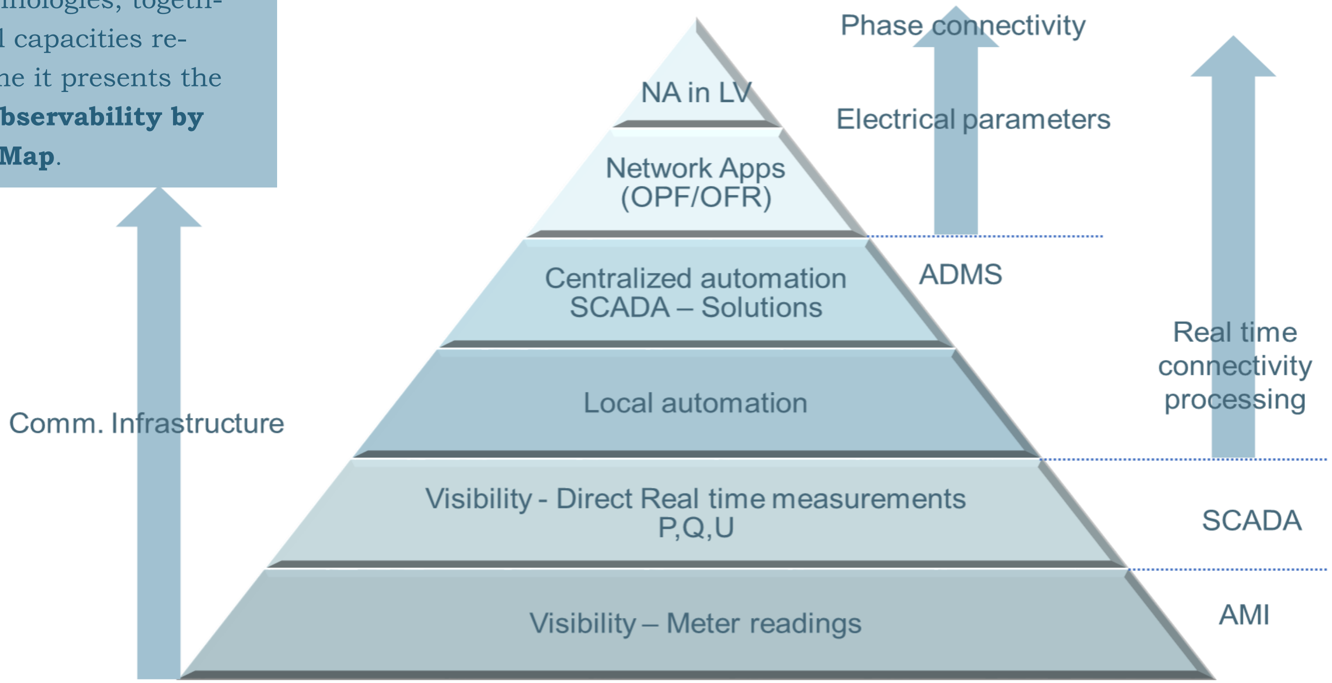
SOGL regulation 2017/1485, art. 2 (48):

'observability area' means a TSO's own transmission system and the relevant parts of distribution systems and neighboring TSOs' transmission systems, on which the TSO implements real-time monitoring and modelling to maintain operational security in its control area including interconnectors. The definition does not define observability from DSO point of view.

Grid as a source of flexibility is closely related to the physical structure of the system. It also refers to the existence of advanced controls to enhance communication among system elements that enables, for example, automated control of generators, automatic activation of demand response or advanced power flow control, switching on the network topology, manual / automatic regulation of transformer taps.

Observability: Smart meters in stations/substations/consumers - measurement of basic values. Balancing meters to determine the level of balancing of the area. Devices/sensors/systems to monitor line overloading, voltage levels, data analysis systems. Advanced and stable communication system and data acquisition, storage and analysis necessary. Remotely controlled switches enabling remote network reconfiguration. Physical measurements (P,Q,U,I) in the SCADA system available at the line paths of the station, and deeper within the network. Balancing meters at substations. Measurement observability for generation units of RfG type B and C in the SCADA system and the possibility of remote power control at the level of HV and MV.

Different levels of technological evolution required to apply the different state of the art available technologies, together with the technical capacities required. At the same time it presents the general idea of **grid observability by the Road Map**.



FLEXIBILITY RESOURCES

PV AND WIND GENERATION

ENERGY STORAGE

REACTIVE POWER COMPENSATION

ELECTROLYSIS

AGGREGATORS COMMUNITIES MICROGRIDS

CONTROLLABLE LOAD (DSR)

ACTIVE CUSTOMERS

HEAT PUMPS EV