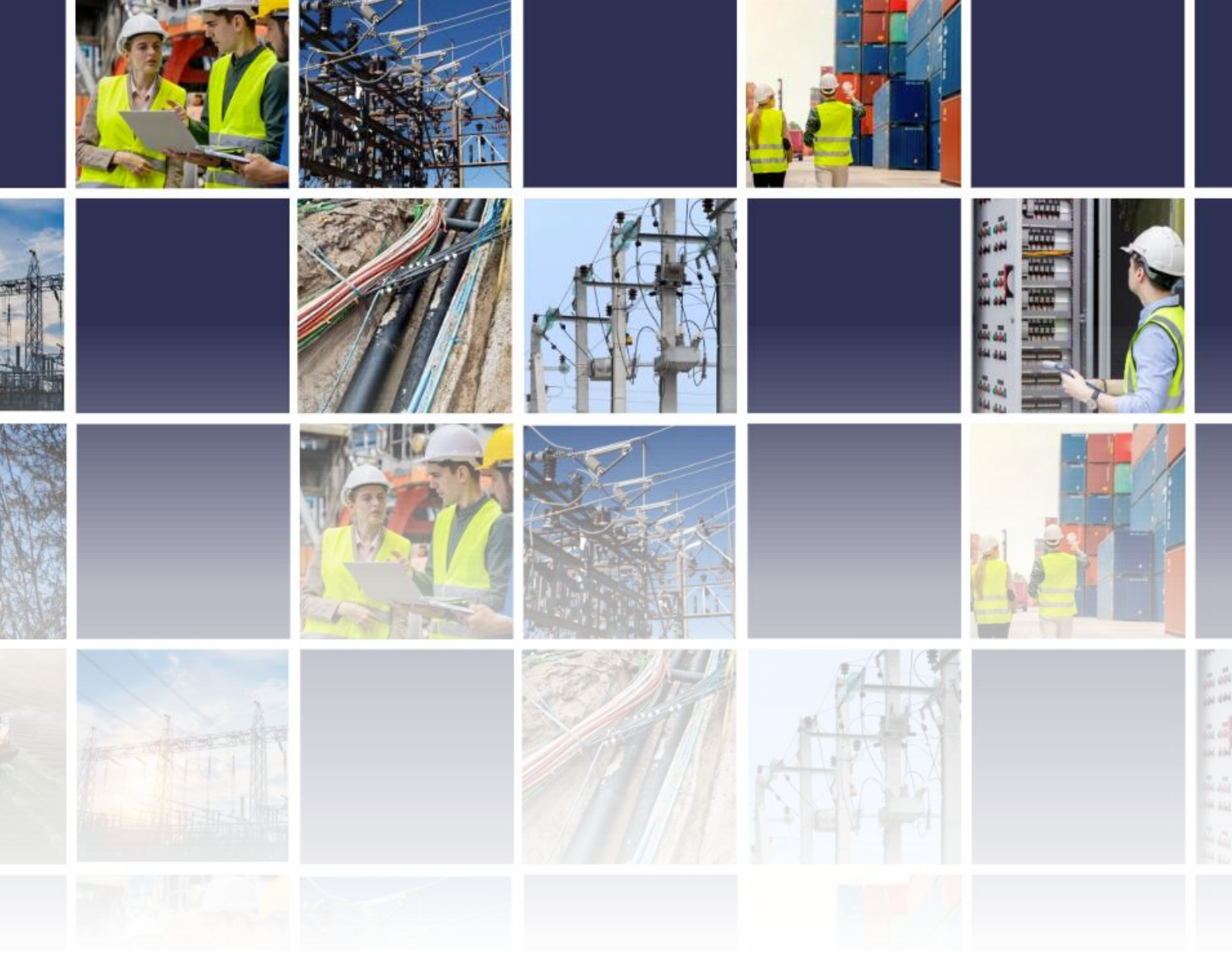

Distribution System Operators and the Supply Chain challenge

DSO ENTITY
DSOs FOR EUROPE

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Introduction

Distribution System Operators (DSOs) are encountering a growing challenge in sourcing essential equipment and key components, driven by factors like strained supply chains, manufacturing shortages or cross-sector competition for certain components such as chips or (affordable) raw material. Action Point 13 of the Grid Action Plan (2023/757/EC) acknowledges this challenge and calls on the supply industry and System Operators to explore ways to alleviate the problem by supporting standardisation efforts, developing common practices and enhancing the visibility into product pipelines of grid operators.

Given its magnitude and manifoldness, the challenge cannot be solved by actions of grid operators and suppliers alone. To this end, fostering stronger cooperation among DSOs, suppliers, policymakers, and other key stakeholders is crucial. Effective collaboration can help overcome technical and logistical barriers. In many countries, DSOs and their national associations have been taking proactive measures to mitigate these technical and logistic hurdles, including the adoption of good practices to streamline certification processes, simplify procurement procedures for suppliers and participate in joint procurement activities. Also, more recent publications such as the Clean Industrial Deal (2025/85/EC) or the Action Plan on affordable energy (2025/79/EC) addressed the supply chain challenges for grids and announced measures that should help to increase production capacity within the EU. The revision of the EU public procurement framework, announced for 2026, will also be a strategic file to ensure a resilient and smooth supply chain.

By strengthening these collaborative efforts, stakeholders can better align their activities and resources, creating a more resilient and adaptive supply chain. **This paper shares insights from two surveys conducted among the members of DSO Entity and E.DSO[1] on the topic of supply chains, shedding light on the current challenges and providing a foundation for improving cooperation in addressing these supply chain issues.**

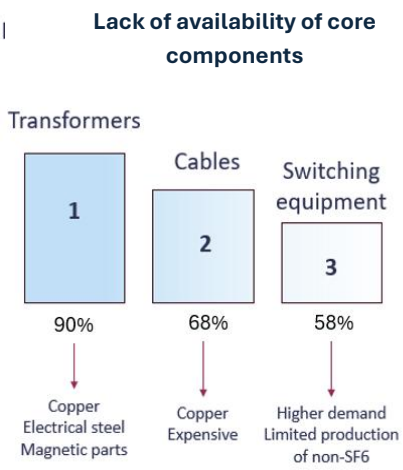
[1] For more on the EU DSO Entity and E.DSO, please refer to their respective websites: https://eudsoentity.eu/ and https://www.edsoforsmartgrids.eu/.

1. Identifying the challenges: external and internal constrains weighting on DSOs

External challenge: supply chains constrains and disruptions

Efforts to increase decarbonisation and electrification have escalated the demand for equipment on the whole electricity value chain. DSOs, which connect more than 70% of the renewable capacity, are at the forefront of this development and struggle to procure the needed assets on time. One example of the rapid increase of the demand in grid components is the stark growth of connection requests for Solar PV which rose, for instance, in Latvia by 1425% within one year (from 2021 to 2022). Accommodating this new demand requires the expansion, modernisation and upgrading of the distribution grid, implying new equipment.

DSO Entity's member survey collected responses from 19 diverse DSOs from 18 EU countries and representing more than 50% of all connections in the EU. The responses challenges identified **three categories of critical and hard to procure components**:



- **Transformers (90% of responses):** The need for transformer stations and their components were mentioned for all voltage levels, i.e. HV/MV/LV; conventional and innovative (i-trafo).

- **Cables (68% of responses):** While some DSOs (mostly those without a strong national cable industry) reported more problems to procure cables than others, high prices for copper, aluminium and plastics seem challenging for DSOs in all countries.

- **Switching equipment (58% of responses):** Components explicitly named were switchboards, switchgear (especially SF6-free), circuit breaker, earthing switches and others.

In addition to the first three categories, respondents also heavily mentioned the following components as most critical for the grid: Smart meters, IT- and telecommunication equipment (e.g. digital equipment for network automation and observability).

While supply chain constraints are primarily caused by the significant increased demand for equipment due to decarbonisation and increased electrification, the concrete constraints seem to be rooted in:

- **The scarcity of certain individual components** (such as chips) or (affordable) raw material to produce them (such as copper, steel or aluminium)
- **New sustainability requirements,** such as the ban of SF6-switchgear**,** restraining the availability of materials during the adaptation time needed at production level.
- **Shipping problems** (such as in the far East)
- **Lack of production capacity** (max. production capacity; hesitation to apply for tenders given fears about availability of raw materials and/or shipping constraints)

- **Competition with other energy actors such as renewable energy producers** for equipment (transformers), as DSOs face the additional challenge of having extensive specification criteria applying to them.
- **Lack of qualified labour impeding** the whole supply chain.

Summing up, this overview showed that **constraints in procuring material are emphasised on core, essential components rather than some negligible "luxury items".** Thus, the topic is crucial and requires a well-orchestrated approach to different political levels and between sectors. In parallel to more comprehensive European strategies on how to tackle supply chains challenges, more sustained exchanges between the two ends of the chains, DSOs and technology providers have already been engaged in to create a coordinated approach to the shared challenges between the two sectors.

However, while those state-of-play elements depend on more than DSOs themselves, it is important to understand the structural particularities of DSOs as well that hinder even more their access to core materials, and which DSOs are proactively trying to overcome.

Internal challenges: the inherent complexity of DSOs' needs

Electricity distribution systems are complex, diverse, and fragmented by nature. This has direct impact on their needs, on their procurement of core materials and the possibilities allowed on perfecting it.

With more than 40,000 different components, technical complexity and differences in equipment are higher for DSOs than TSOs. This often entails more complex, tailor-made equipment needs for DSOs.

Technical legacies from the past still exist leading to high fragmentation, not only between countries but sometimes even within the same company when operating in different regions. This entails less harmonisation of materials, specifications, or processes among the more than 2,500 electricity DSOs in Europe.

Nevertheless, **a variety of initiatives exist between different actors and at different levels aimed to reducing technical complexity and increasing efficiency in procuring core DSO-grid components.**

Different initiatives derive from:

- **National energy or industry associations**, supporting the alignment of processes within the country
- **Trans-national DSOs** aligning their processes within their group and therefore among their branches operating in different countries.
- **Larger entities alignment (for instance DSOs or TSOs)** within a country or even cross-border.
- **Within the company in the same country for large-scale or national DSOs.**
- **Cross-sectoral** alignment for the procurement of services.
- **Cross-border alliances voluntarily undertaken,** aligning specifications and procurement processes.

The need to mitigate both external and internal challenges led to the proactive development of solutions, which shows the relevance of the topic for grid operators, from all countries, sizes, and voltage-levels. These solutions and practices range from undertaking voluntary standards and certification programs to alleviate technical complexity, to the development of pre-qualification practices that facilitate the procurement of material and services.

2. Overcoming the challenges: proactive practices of DSOs supporting continuity of supply

Technical complexity in equipment: proactive alignment on certifications

Good practices to simplify certification processes

- **Belgium (Fluvius)** The national association of grid operators, Synergrid, supports the alignment between national DSOs and TSO is realised via the national association (Synergrid). This encompasses the certification of components (e.g. smart Ring Main Units (RMU)) or the alignment of product specifications (e.g. cables, transformers).
- **Austria (Wiener Netze)** The regionally operating DSO reported the common agreement of Austrian DSOs to accept suppliers certified by Wiener Netze. Thereby, Wiener Netze can supply cable accessories to all Austrian DSOs in urgent cases. This allows for a limited interoperability of materials and therefore safeguards for greater resilience of the national distribution network.

Ensuring voluntary interoperability through alliances

- **G3-Alliance for smart metering** is a consortium created to standardise and promote G3-Technologies globally (G3-Hybrid and G3-PLC technologies) as well as establish an industrial certification program to guarantee for the interoperability of devices from different manufacturers. The Alliance reunite stakeholders of the smart grid industry, including DSOs such as Wiener Netze (Austria), Enedis (France), or Creos (Luxembourg).
- **CIRED (International conference on electricity distribution)** is a network of energy distribution stakeholders dedicated to public distribution systems and of large installations using electrical energy in industry, services and transport. The organisation notably produces papers on developments and best practices in technology and the management of electricity distribution.
- **The PRIME (PoweRline Intelligent Metering Evolution) Alliance** provides an open standard for smart grid communications, enabling interoperability between DSOs and suppliers. This allows multiple vendors to develop compatible solutions, enhancing the efficiency and reliability of smart grid deployments. The Alliance includes key industry stakeholders such as Iberdrola, e-distribución, i-DE, Viesgo (Spain), E-REDES (Portugal), Energa Operator (Poland), and E.ON (Germany).

Inherent complexity of procurement: facilitation and streamlining of processes

Facilitation and streamlining of procurement practices: pre-qualification systems

- **A majority of DSOs surveyed (95%) reported having implemented**, either proactively or by law, **standardised procurement programs**. One example of such practice is the development of recurring procurement programs, allowing for the procurement plans to be formulated on a cyclical basis. The DSOs' needs in material and services are more easily covered and estimated on a set timeframe (for instance with monthly forecasts) with only corrective actions to be performed, if needed. Polish DSO Tauron reported for instance the implementation of cyclical procurement, with positive impact on the continuity of supply.
- In addition to recurring procurement programmes, Directive 2014/25/EU on procurement by entities operating in the water, energy, transport and postal services sectors has introduced **a qualification system, especially suitable for technical demanding works, supply and service**

contracts. Examples of **pre-qualification systems for materials and suppliers have been reported** for instance in France, Bulgaria, Greece, Lithuania, and Austria, to simplify certification processes. These systems allow for the contracting DSO to screen potential suppliers ahead of a tendering process, reducing the workload of both suppliers and grid operators to accelerate the awarding of contracts. In Lithuania for instance, the national DSO (ESO) makes available to contractors a list of recommended equipment and materials in some areas of its procurement. Any contractor using equipment or material on this list will not be required to go through additional certification processes.

Joint procurement initiatives and platforms

- **France (Enedis):** The largest French DSO reported the organisation of a common procurement platform among French DSOs, using quality material tested by Enedis. This procurement solution allows the French DSOs to fulfil their obligation of smart meter roll-out, all the while buying the same material, at the same (competitive) price. This solution allows for additional interoperability between French DSOs, and for smaller ones to benefit from added visibility and more favourable buying conditions.
- **Netherlands (Alliander, Stedin, Enexis):** The Dutch DSOs cooperate beyond of the scope of energy distribution, to allow for a faster expansion of their grid. In the Northeast region of the Netherlands, utility companies and grid operators have launched joint tenders to procure skilled labour for the common underground work on the energy, drinking water, and telecommunications grids and networks. This allows for faster selection process, lesser administrative burden on a single company, and therefore faster operations to install or replace sections of the distribution grid.

The struggles met in terms of procurement go beyond the proactive solutions of distribution system operators alone. Building stronger exchanges between the supply chains and the grid operators is already a way forward to a more holistic approach to the challenges identified. Longer forecasts of grid operators' needs and projects pipelines are currently being developed in that direction.

3. DSOs' efforts to enhance visibility of their projected needs to suppliers

The results collected by DSO Entity were supported and complemented by a survey from E.DSO, focused on the visibility needs of its members. As highlighted by Action 13 of the Grid Action Plan, industrial stakeholders request more visibility on DSOs' equipment needs for the coming years. In this context, E.DSO launched a study, based on its collaboration with T&D Europe, aimed at averaging the equipment needs forecasts of DSOs, while maintaining a realistic and useful level of granularity for industrial partners. By enabling earlier planning of production schedules aligned with future grid expansion needs, forecast initiatives help to reduce the risk of delays and make the grid supply chain more resilient.

Seven DSOs from six Member States, representing over 65 million customers and 2.4 million kilometres of lines, replied. The data were weighed based on both the number of customers and the network length for each respondent. This survey, conducted over summer 2024, provides a forward-looking view through to 2030. Whether for cables (figure 1) or MV/LV transformers (figure 2), **a strong increase in equipment needs is clearly visible, emphasizing the growing need for better planning**. For instance, the DSO-only demand for cables in 2030 is expected to be 40% higher than in 2021.

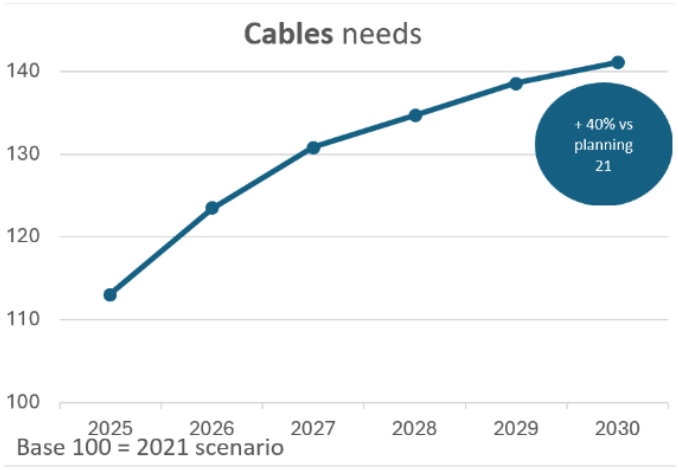


Figure 1: Projection of the respondents' needs for cables assets between 2021 and 2030 (E.DSO)

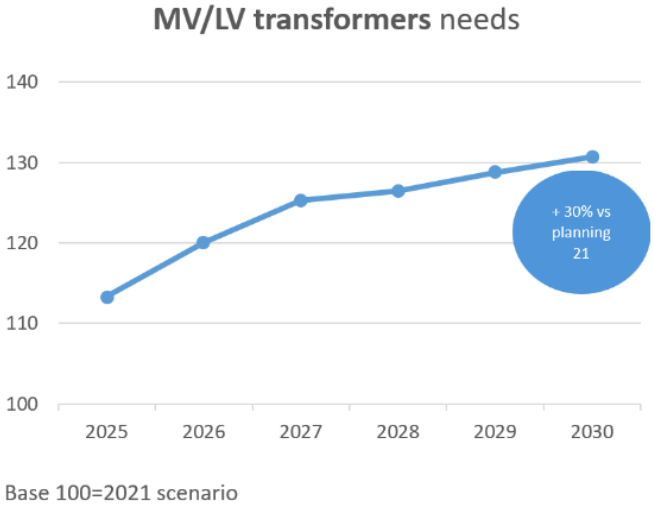


Figure 2: Projection of the respondents' needs for MV/LV transformers between 2021 and 2030 (E.DSO)

Alongside Action Point 13, the Grid Action Plan Communication contained Action Point 3, recommending the mapping of DSO Network Development Plans (DNDPs), evidencing the need for more inter-linked solutions to supply-chain struggles. The DNDP details medium to long-term flexibility service needs and planned investments for the next five to ten years, focusing especially on essential distribution infrastructure to support new generation capacities and loads.

Article 32(3) and (4) of the Electricity Market Directive (2019/944) created an obligation for DSOs to develop, publish, and update a transparent DNDP every two years. As the Directive is not yet transposed in all Member States, not all DSOs are currently developing and/or publishing DNDPs. However, the pace of uptake is fast as DNDPs are publicly available already in 17 countries, and more expected to enforce the new obligation in the upcoming year. No harmonized DNDP among European countries and DSOs has yet been implemented, giving a diversity of models and practices. While some DSOs do not yet make their plans publicly available, some provide great levels of granularity, with breakdowns of equipment needs being made available.

Within DSO Entity, Task Force Network Planning (TF NP) is currently investigating ways to enhance the effectiveness and viability of such plans, and already exposed their recommendations at the occasion of the Copenhagen Forum of June 2024, in the form of a report "DSO Entity's identified good practices on Distribution Network Development Plans"[2] . Sustained developments in that direction would, in the end, foster transparency, facilitate improved collaboration with TSOs to effectively integrate DSOs into the EU system of systems and ultimately drive customer benefits such as quality of service, lower costs, and increase access to more competitive energy markets.

In line with the implementation of Action 13 of the Grid Action Plan, DSO Entity intensively works with ENTSO-E, T&D Europe and Europacable on supply chain issues. In parallel, E.DSO and T&D Europe also continuously collaborate in a joint group since October 2023 to exchange indications and visibility on the future evolution of the grids and the dynamic of the equipment manufacturers' production plans, as highlighted by the survey launched by E.DSO.

[2] DSO Entity (June 2024) DSO Entity's identified good practices on Distribution Network Development Plans. Available online.

4. Conclusion and recommendations

The Clean Industrial Deal underlines **the relevance of the electricity infrastructure for a competitive and resilient EU**. Sufficient investments in grids are necessary to accelerate electrification and the connection of renewables that will help to lower electricity prices in the long run.

Long lead times for core grid components are increasingly challenging the realisation of the energy transition and the EU's competitiveness by slowing down the necessary grid build-out. DSOs encounter problems in sourcing key components, driven by factors like strained supply chains, manufacturing shortages, cross-sector competition for components such as chips or affordable raw material and complex procurement provisions.

This paper gave insights into the **challenges DSOs are facing when procuring equipment** for the expansion and maintenance of their grids and solutions they have developed to tackle the challenges. The paper also provided information and **greater visibility into the expected increase in key components** to give European suppliers more predictability about future demand.

Despite measures developed by DSOs among themselves and beyond their sector and recently announced activities at the EU level, greater **support will be needed on all levels to solve the issues in the interest of a sustainable and reliable energy transition.** The table below provides a short overview of **necessary measures** directly or indirectly connected with the topic of supply chains.

Grid challenges		Implementation of existing EU-rules	New EU initiatives	National level (NRAs, MS)
Supply chains	DSOs encounter challenges in sourcing key-components, driven by factors like strained supply chains, manufacturing shortages, cross-sector competition for components such as chips or affordable raw materials	- Net Zero Industry Act (2024/1735) acknowledgement of grid technologies as **strategic net-zero technologies** - GAP AP 13 – continuation of collaboration between system operators and manufacturers	- Measures to increase **EU manufacturing capacity** (NZIA Implementing Acts on components) -Announced **grid manufacturing package** of € 1.5 bn (Affordable Energy AP 2025/79/EC)	
Public Procurement	Complex EU procurement provisions and obstacles to joint procurement initiatives at member state level further delay timely procurement of key components	- Ensure **coherence and simplicity** of procurement-related legislation (e.g. NZIA sustainability and resilience criteria vs. cost-efficiency goals in Public Procurement Directives)	- Simplification of the **Public Procurement Directives** (2014/23-25) with the right balance between environmental goals, efficiency and flexibility	-MS: removal of potential obstacles to **joint procurement initiatives**
Staffing	DSO labour shortages are caused by the increase of staff needed to facilitate the transition, the transformation of jobs due to digitalisation and high competition for workers in energy.	-**Active inclusion** of DSOs in existing EU initiatives for (re-) skilling of the workforce (e.g. EU Pact for Skills; NZI academies)	- Launch an **EU targeted *Skills Academy for Grids***, as envisaged in the Union of Skills or a ***European Grids Academy*** under the framework of the Net-Zero Academies	- MS: **Support for cooperation** between DSOs and the educational sector (universities, schools) to proactively tackle staff shortages.