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Distribution Systems Working Group (DS WG)

New Services and DSO Involvement

A CEER Conclusions Paper

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INFORMATION PAGE

Abstract

This document (C18-DS-46-08) presents CEER's position on new services and the involvement of Distribution System Operators (DSOs). It builds upon previous CEER work on the *Future Role of DSOs* and the European Commission's *Clean Energy for All Europeans* package. It also contains CEER's reflections on the helpful input received at the CEER Distribution Systems Workshop held on 16 January 2019.

The CEER position on new services and the involvement of DSOs presented in this document concerned is aimed to provide more clarity on activities associated with DSOs to all relevant actors on specific grey areas. It concerns the following key areas:

- Definition of Interface;
- Storage;
- Direct services to the consumer;
- Data management;
- Telecommunications and services outside of the energy sector.

Target Audience

European Commission, energy suppliers, distribution system operators, other network operators, traders, electricity/gas customers, electricity/gas industry, consumer representative groups, Member States, telecommunications companies, regulators of various sectors, academics and other interested parties.

Keywords

Distribution networks, Regulation, Goals, Aims, Electricity, Gas, Incentives, Income, Costs, Innovation, Telecommunications.

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Related Documents

CEER Documents

- Regulatory Challenges for a Sustainable Gas Sector, CEER Public Consultation Paper, 22 March 2019, Ref. C18-RGS-03-03.
- CEER Public Consultation Paper on Dynamic Regulation to Enable Digitalisation of the Energy System, 18 March 2019, Ref. C18-DSG-03-03.
- CEER's 3D Strategy (2019-2021) Digitalisation, Decarbonisation, Dynamic regulation: CEER's 3D Strategy to foster European energy markets and empower consumers, 9 January 2019, Ref. C18-BM-124-04.
- CEER Conclusion Paper on Flexibility Use at Distribution Level, 17 July 2018, Ref. C18-DS-42-04.
- CEER Report on Smart Technology Development, 5 June 2018, Ref. C17-RMF-101-04.
- CEER Future Role of Gas (FROG) Study, 6 March 2018, Ref. C17-GPT-04-01.
- CEER Conclusion Paper on Incentives Schemes for Regulating Distribution System Operators, including for Innovation, 19 February 2018, Ref. C17-DS-37-05.
- CEER 2018 Work Programme, 30 January 2018, Ref. C17-WPDC-29-07.
- CEER Report on Power Losses, 18 October 2017, Ref. C17-EQS-80-03.
- CEER White Paper on Renewable Self-Consumers and Energy Communities, White Paper series (paper # VIII) on the European Commission's Clean Energy Proposals, 27 July 2017.
- Distribution and Transmission Network Tariffs and Incentives, CEER White Paper series on the European Commission's Clean Energy Proposals (paper # I), 11 May 2017.
- CEER Guidelines of Good Practice for Electricity Distribution Network Tariffs, 23 January 2017, Ref. C16-DS-27-03.
- CEER Report on Review of Current and Future Data Management Models, 13 December 2016, Ref. C16-RMF-89-03.
- CEER Position Paper on the Future DSO and TSO Relationship, 21 September 2016, Ref. C16-DS-26-04.
- The Future Role of the DSO, CEER Conclusions Paper, 13 July 2015, Ref. C15-DSO-16-03.

External Documents

- European Commission Clean Energy for All Europeans package, 1 January 2019 – *this document refers to 11 January 2019 post-trilogues versions of the Electricity Regulation and Electricity Directive.*
- Energy Regulation: A Bridge to 2025, ACER Conclusions Paper, 19 September 2014.
- European Commission 3rd Energy Package, July 2009.

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EXECUTIVE SUMMARY

The core role of Distribution System Operators (DSOs) has been very clear in the past decades. DSOs have been and will continue to be responsible for the design, maintenance, development, and operation of the distribution system. The transition to a decarbonised energy system as well as technological development, particularly facilitated by digitalisation, has led to changes of current activities carried out by DSOs and the creation of new activities, within or related to the energy system. For these new activities, questions are emerging whether DSOs should be allowed to participate in them or not and – where relevant – under what conditions. From the perspective of creating effective markets we underline two principles: a DSOs' primary task is to facilitate the energy sector – in particular the energy market – in a neutral manner. At the same time, DSOs should not unduly distort competition for services which are to be provided by competitive markets.

For specific activities however, it is not always straightforward to determine how a certain activity would be classified (core portfolio or competitive service), or where the exact boundaries for undertaking certain activities are. Both policymakers and regulators are pressed to provide more clarity. In 2015, CEER published its Conclusions Paper on *The Future Role of DSOs*, outlining regulators' foundation for their thinking regarding DSOs and commercial market activities. The Clean Energy for all Europeans Package is providing greater legal certainty regarding certain activities, such as flexibility services and providing electric vehicle (EV) charging points.

This document aims to contribute to the debate by providing further clarity on NRAs' positions regarding remaining grey areas for energy system services:

- Storage;
- Direct services to the consumer;
- Data management;
- Telecommunications and services outside of the energy sector.

In this paper, CEER concludes:

- A market-centric approach for the facilitation of services should be used wherever possible in order to minimise the risk of DSOs making use of their inherent advantage regarding the provision of services due to them holding a monopoly position.
- DSOs must act as neutral market facilitators and in the public interest, accounting for costs and benefits of different activities. As neutral market facilitators, DSOs are vital to facilitate service markets – by performing their core activities related to the distribution system. Furthermore, DSOs should avoid creating undue distortion of activities open to competition by acting in a non-discriminatory manner towards all actors.
- The design, maintenance, development, and operation of the distribution system forms the core of a DSO's activity. This includes providing relevant network information to third parties to enable them to provide their services. Connection and metering activities can be considered as core activities; this includes Member States where DSOs are legally obliged to carry out those activities. Telecommunication infrastructure can be used and owned by DSOs to support the operation of the grid where this has been permitted by NRAs under specific conditions.
- The boundary between the DSO's core activity and the provision of other services must be drawn clearly; this is particularly important in the context of integrating different energy systems. Clear boundaries help ensure DSO activities are confined to those that may be carried out by the neutral market facilitator and do not overlap or interfere with activities that should be left to market players.

- Where activities are open to competition, the DSO should not be allowed to be active in that area. This is due to the DSO having part of its costs covered by regulated tariffs, and it therefore carries a lower risk profile supported by its core monopoly activity, thereby placing the DSO in an advantageous position over other market parties.
- In order to facilitate better outcomes in circumstances where the market cannot (yet) provide the activity, NRAs should be in the position to decide on exceptions. Such an exception should be based on a thorough market analysis. It could be granted, under conditions, with explicit consent by the NRA. Conditions can include restrictions that the activity may only be performed on a temporary basis, while the NRA can review the approval, monitor the performance of the activity and take account of relevant developments in the market.
- CEER NRAs have determined that activities which, in principle, are open for competition are the following (list not exhaustive): Providing flexibility services (including storage), the development, ownership and operation of EV charging points, and the provision of direct services to consumers (including specific energy efficiency advice), data analysis services and enriched data to third parties.
- DSOs may be permitted to offer services outside the energy sector, for example telecommunication services, however, such activity may only be granted under certain conditions. Regardless, it is crucial that DSOs do not neglect their core tasks and retain separation between their regulated activities and other service provisions. This is primarily required to avoid cross subsidisation.
- As the transition in the energy sector progresses, policymakers and regulators should continue to develop their thinking regarding activities which may involve DSOs. By creating more clarity regarding market structures and defining more clearly the roles of the different players and stakeholders in a rapidly developing energy landscape, legislators and regulators can facilitate the development of additional market activities.

1 Introduction

The core role of Distribution System Operators (DSOs) has been very clear in the past decades. DSOs have been and will continue to be responsible for the design, maintenance, development, and operation of the distribution system. The transition to a decarbonised energy system as well as technological development, particularly facilitated by digitalisation, has led to changes of current activities carried out by DSOs and the creation of new activities, within or related to the energy system.[1] For these new activities, questions are emerging whether DSOs should be allowed to participate in them or not and – where relevant – under what conditions.

In 2015, CEER published its Conclusions Paper on *The Future Role of DSOs*[2], outlining regulators' foundation for their thinking regarding DSOs and commercial market activities. Here, CEER distinguished three types of activities across the distribution sector. Activities related to the core of grid design, maintenance, development, and operation are attributed to DSOs only. However, activities which are – or potentially could be – carried out by market parties in a competitive environment, should not be performed by DSOs, as doing so has the potential to distort competitive markets. In specific circumstances, activities could be allowed under certain conditions when there is express justification.

DSOs must always act in the public interest and as neutral market facilitators. However, for specific activities, it may not always be straightforward under which category a certain activity would fall, or where the exact boundaries of for undertaking such an activity are.

The Clean Energy for All Europeans Package (Clean Energy Package, CEP) will provide greater legal certainty regarding certain activities, such as flexibility services and providing electric vehicle (EV) charging points.

This document aims to contribute to the debate by providing further clarity on NRAs' positions regarding remaining grey areas for energy system services:

- Storage;
- Direct services to the consumer;
- Data management;
- Telecommunication and services outside of the energy sector.

As part of the process to develop this document, CEER consulted with over 30 stakeholders at a roundtable in January 2019. A summary of the discussions is provided in Annex 2.

The structure of this document is as follows. Chapter 2 captures the essence of CEER's view on DSO activities, as was laid down in previous work. In chapter 3, CEER starts distinguishing DSOs activities from the core - operating, maintaining and developing the distribution system - and describing the physical boundaries of the distribution system. In Chapter 4 (storage), Chapter 5 (direct services to the consumer) and Chapter 6 (data management) CEER goes into the discussion of specific grey area activities. Chapter 7 (telecommunications) also addresses a grey area activity, while at the same time being an

[1] See CEER's 3D Strategy (2019-2021) Digitalisation, Decarbonisation, Dynamic regulation: CEER's 3D Strategy to foster European energy markets and empower consumers, 9 January 2019, Ref. C18-BM-124-04, and the CEER Public Consultation Paper on Dynamic Regulation to Enable Digitalisation of the Energy System, 18 March 2019, Ref. C18-DSG-03-03.

[2] CEER Conclusions Paper on The Future Role of DSOs, 13 July 2015, Ref: C15-DS-16-03.

example of an activity which gradually could leave the energy sector and cross the border to other sectors. CEER concludes the document in Chapter 8.

2 CEER's view on DSO activities

CEER outlined its position regarding the role of DSOs in its 2015 conclusions paper[3]. Here CEER describes four principles for DSOs and a framework to determine what activities DSOs should and should not undertake.

1) DSOs must run their businesses in a way that reflects reasonable expectations of network users and other stakeholders, including new entrants and new business models;
2) DSOs must act as neutral market facilitators in the way they undertake core functions;
3) DSOs must act in the public interest, accounting for costs and benefits of different activities; and
4) Consumers own their data and DSOs must safeguard this principle when handling any such data.

In this document, CEER refers to the DSO as defined in Directive 2009/72/EC of the European Parliament and of the Council[4]. The 'distribution system operator' is described as a '*natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity'*. Here 'distribution' means *the transport of electricity on high-voltage, medium-voltage and low-voltage distribution systems with a view to its delivery to customers, but does not include supply*. Although these definitions originate in the context of electricity distribution systems, they can also be applied for the operators of distribution systems for gas at high and low pressure.

CEER is clear that DSOs should be neutral market facilitators. DSOs have an important role to play in facilitating markets. To fulfil this role effectively, DSOs must be impartial in the way they undertake their functions. This means regulatory frameworks must ensure the risk of conflicts of interest arising for DSOs is minimised. This is particularly important with regards to investment decisions and the operation of their networks. Accordingly, CEER NRAs are actively shaping the regulatory framework and undertake enforcement action where required. Where competitive activities are carried out by monopoly network operators, there is significant risk that competition may be distorted, potential market entrants may be deterred, and incentives for network operators to invest efficiently and impartially in their networks may be affected. As DSOs control the underlying infrastructure, there is a risk of obstructing activities of other market participants.

Where a DSO is participating in a competitive market, there is the risk that it may refer to its knowledge of operational parameters of the network to gain an advantage – this would be a market distortion which would be further amplified by DSOs' access to capital at lower cost (supported by their regulated asset base) to fund any investments for undertaking service activities. Such conflicts of interest must be avoided wherever possible. Where this is not possible, they must be managed appropriately to reduce the risk of distorting markets.

Figure 1 sketches out the decision framework set out in the conclusion paper on *The Future Role of DSOs*. Understanding whether a service is (or can be) provided by competitive

[3] Ibid.
[4] Directive 2009/72/EC of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC.

market parties is a key to assess whether an activity should or should not be part of the core set of activities undertaken by a DSO.

In general, where an activity is carried out by entities other than the DSO and the market is sufficiently developed, DSO involvement in such activities is likely to disturb the competitive market. In this scenario, the DSO should not be allowed to carry out the activity.

When there is the potential for competition to develop across new activity areas, regulators usually have the option to either allow the DSO to undertake the activity under special conditions (imposed by the regulator), or disallow DSOs from undertaking such activity. The rationale for such regulatory intervention is twofold. Firstly, CEER believes competition is considered the best means to meet customer requirements in the most cost efficient way; therefore competition should not be impaired Secondly, the DSO has access to lower cost capital which it can use to finance investment in competitive activities; this would be an abuse of the DSOs privileged position of having its cost covered by regulated tariffs, therefore providing it with an advantage to other market parties.

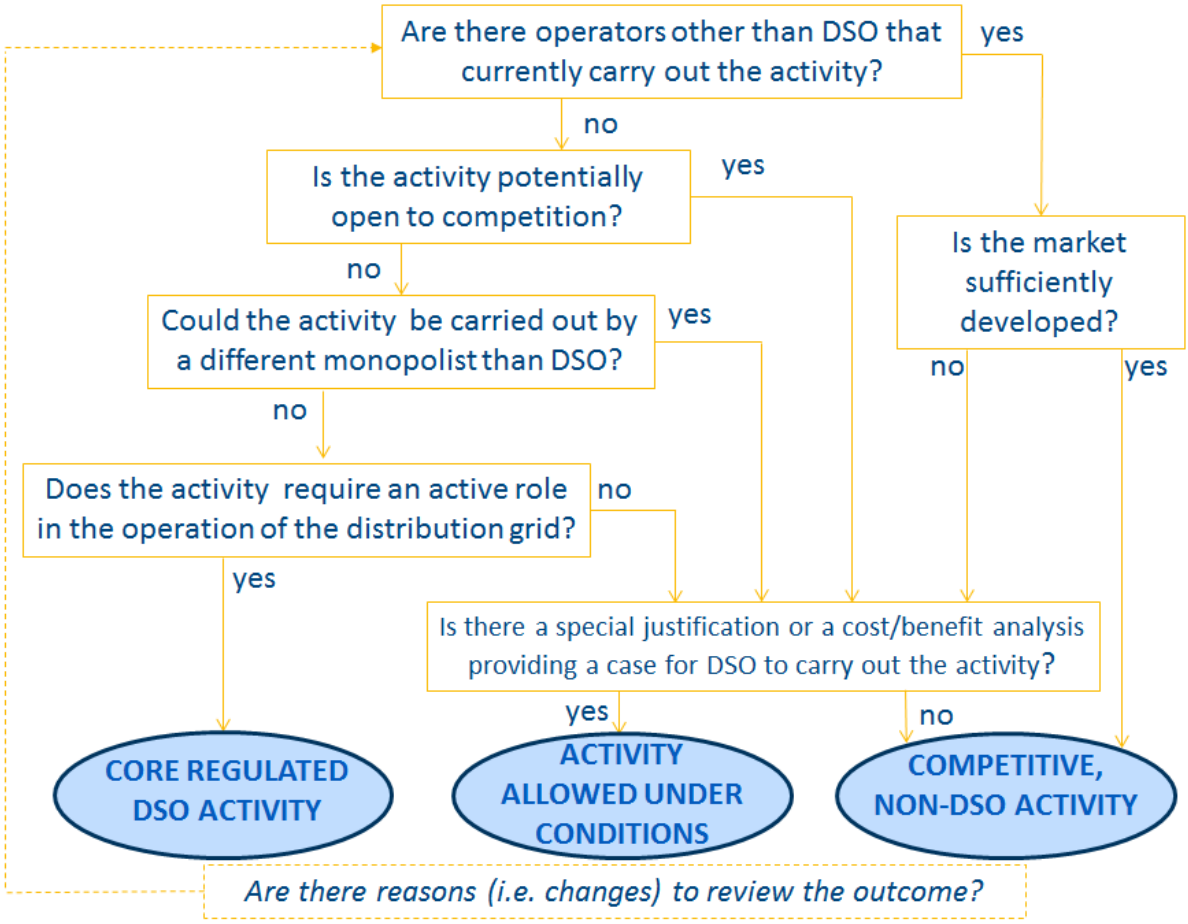

Figure 1: Decision Framework for allowing DSOs to participate in an activity

CEER has identified three categories for activities which allow NRAs to broadly asses to which degree regulatory control/intervention may be required:

i. Core regulated activity
ii. Activity allowed under conditions and with justification
iii. Competitive non-DSO activity

In general, where an activity lies at the core of the network itself, such as the design, maintenance, development, and operation of the network – including connection and metering in many Member States – and where it can typically only be performed by the DSO, it is a *core regulated activity*. This activity would not be open to potential competition. As described above, there are also other activity portfolios which DSOs may be able to get involved in under certain circumstances, and again others where regulators would seek to prevent DSOs from being active altogether.

However, DSOs may, by exception, be permitted to perform activities under certain conditions or regulatory controls, even in an activity space where there may be potential for competition. DSOs may be granted to participate in such an activity where there is clear and specific justification, possibly based on a cost/benefit analysis. Exceptions may be accompanied by conditions, such as limiting the level of engagement by the DSO, limiting the period of involvement in the new activity and/or introducing transparency requirements to limit the degree of possible market distortion.

CEER recognises that there are differences across European countries in the number, size, and the activity profile of DSOs as much the technical characteristics of distribution systems (e.g. voltage levels) and the challenges facing each network operator (especially variable RES electricity generation connected to distribution networks) differ. This means that there is no single model for the role of the DSO across Europe. This requires the relevant NRA to determine under which conditions a DSO might be allowed to undertake the activity in their national context. Further, CEER suggests that the more DSOs are involved in non-core activities, the greater the need for regulatory control or unbundling. CEER's regulatory premise is that a well-functioning and competitive market is the most likely to lead to more cost-efficient outcomes for consumers.

3 Definition of Interface

DSOs are responsible for operating, maintaining, and developing the distribution system. This chapter describes the physical boundaries of the electricity and gas distribution systems and the interface between the DSO's own distribution system and those of other operators. Contractual interfaces (including those behind data provision) are not described in this chapter, but where relevant are referred to in the following chapters.

3.1 Electricity

For electricity distribution, interfaces of a distribution grid can be classified as:

1. Interface Distribution-Transmission (D-T interface);
2. Interface Distribution-Distribution (D-D interface);
3. Interface Distribution-Network User (D-NU interface,) where the term "network user" refers to final customers, distributed generators, prosumers, storage units, EV charging stations.

In some countries, additional types of interfaces are known:

4. Interface Distribution-cross border grid (D-XB interface) which are limited to distribution grids in border areas and which can have an interconnection either with a cross-border DSO or (rarely) with the cross-border TSO, mainly for reliability reasons;
5. Interface Distribution-Generation (D-G interface), *without the intermediation of the transmission grid*.

All interfaces shall be metered, although this does not necessarily imply that the DSO is the meter operator for all types of interfaces. In countries where the metering is operated by a different operator than the DSO, a further interface may be present (D-M interface).

3.1.1 D-T Interface

There is no standard which describes the separation of distribution from transmission from a technical point of view. Any separation appears to be related to the voltage levels managed by DSOs. According to European Standard EN 50160, a nominal voltage can be classified as "medium voltage" (MV) if it is comprised between 1 and 35 kV. Below 1 kV, a nominal voltage is classified "Low voltage" (LV), and above 35 kV "High voltage" (HV).

Generally, DSOs operate MV and LV networks, that are typically radial. In many Member States, DSOs also operate some high voltage (HV) networks where the transmission grid does not comprise the whole HV network. In these cases, DSOs not only manage radial networks, but also meshed networks. This has implications on the market as DSOs could be involved in HV congestion management after the day-ahead market session. In other countries, like Italy, and France, DSOs manage only MV and LV grids, and in the same countries the TSO manages all meshed networks, which contributes to a simplification of roles and procedures for solving HV congestions.

Different network structures at the interface D-T have a relevant impact on the role of DSOs. In general, the DSO-TSO relationship has to be strengthened, especially due to impact of increased amount of renewable generation connected to distribution systems on network planning, design, and management. This issue has already been addressed extensively in the CEER paper *The Future DSO and TSO relationship*[5].

[5] CEER Position Paper on the Future DSO and TSO Relationship, 21 September 2016, Ref. C16-DS-26-04.

3.1.2 D-D Interface

Normally, a distribution network is fed by the transmission grid. On occasion, however, distribution networks are connected to each other. The most typical case of a D-D interface is the case of an "embedded DSO", i.e. a DSO which is isolated within a wider distribution system network and is therefore not connected to the transmission grid. Normally, embedded DSOs have a smaller dimension in comparison with the major DSO from which they are fed.

A typical case of an embedded DSO is a small DSO operating only LV networks. In this scenario, the D-D interface is at the secondary transformation station (MV/LV). The larger DSO is often requested to aggregate data and provide the relevant TSO with information on the entire the customer base connected to its network, either directly or through the embedded DSO.

A new type of embedded DSOs emerging currently are so-called "Closed Distribution Systems" (CDS).[6] An important development of such interfaces could happen with Energy Communities[7], in case Member States will allow energy communities to own and operate directly their own distribution network.

3.1.3 D-NU Interface

As a matter of principle, all kinds of network users (NU) can be included in this type of interface. Network users include:

- Final customers, i.e. "demand units", including households, small business, industry, public administration, agriculture etc.
- Distributed generators, i.e. "production units" directly connected to distribution grids
- Prosumers (i.e. final customers with self-generation and/or storage units)
- Storage units, either stand-alone or coupled with demand and/or production units
- Electric vehicle charging stations (please note that a charging station can have one or multiple charging points and may behave as a demand unit or as a prosumer if "vehicle-to-grid" services are activated).

A D-NU interface is bi-directional, i.e. electricity can flow from the network to the network user, and vice versa. When a final customer is a "pure" consumer (i.e. is not equipped with self-generation and/or storage units) energy can only flow from the network to the user. However, there are no provisions preventing this type of consumer from installing self-generation (and/or storage unit) and thereby becoming a prosumer. This is particularly relevant for D-NU interfaces with prosumers to ensure that net metering of self-generation is avoided[8]

In relation to new activities for DSO, there are at least three relevant D-NU interface types requiring further analysis:

[6] Electricity Directive 2007/92/CE art. 28.
[7] Proposal for a Directive of the European Parliament and of the Council on common rules for the internal market in electricity (recast), 11 January 2019 version.
[8] CEER White Paper #VIII Renewable Self-Consumers and Energy Communities, July 2018.

1) Home Area Network (HAN) – communication port of the smart meter to display consumption data in real-time;
2) Electric Vehicle (EV) charging stations - installations accessible to the public where EV batteries can be charged and through which EVs may be used to provide services to the network (so-called vehicle-to-grid (V2G)); and
3) Emergency control for crucial grid interfaces - to protect the power system, a DSO may have to access to operational controls of generation units that are part of prosumer installations.

With regards to the HAN communication port of the smart meter, CEER underlines the requirement that smart meters are interoperable with devices marketed by third parties; this requirement is reflective of the DSO's role as a "neutral market facilitator".

For EV charging points, it is important to recall that such charging infrastructures (typically situated in car parks, at fuel stations or along street level) are "behind the meter" applications. There may be other final uses of electricity within the charging station, fed by the same connection point (for instance in a fuel station there are fuel pumps or car washing installations). The D-NU interface for EV charging is, therefore, the physical connection point between the charging station and the distribution network. CEER addresses EV charging points in more detail in Chapter 5.

3.2 Gas

The grid interfaces considered for electricity distribution networks are applicable to gas distribution networks too. For D-NU interfaces, the term "network users" describes final customers, storage units directly connected to gas distribution networks, biomethane production and injection units and fuel station for Compressed Natural Gas (CNG) vehicles.

The injection of biomethane will – at this moment – usually take place at the distribution level. This gas production can be used by other gas customers on the local network. However, there can be constraints on the biogas production when the amount produced exceeds the amount that can be injected in the network. This is more likely to happen during the summer when the usage of gas is lower. A solution in this case would be to feed the excess production entering the distribution system into the transmission system, which requires a gas booster. This solution encompasses the T-D gas interface. A gas booster increases the gas pressure to inject it into the gas transmission system. On defining what core activities are, in this case it should be decided at national level whether the gas booster would be owned and operated either by the gas DSO or the gas TSO.

3.3 Conclusion

At the core of the DSO's activity lies the design, maintenance, development, and operation of the distribution system. At the same time this system is connected to other parts of the system, like the transmission network or network users, via interfaces. Therefore, it is critical to be specific about the boundaries of the distribution system. Clearly defined boundaries ensure DSO activities are confined to those that may be carried out by a neutral market facilitator and do not overlap with activities that have involvement of market players.

It is also important to spell out the boundaries of the distribution system in the context of the integration of different energy systems which is likely to become a more prominent feature as the energy transition progresses. One example would be power-to-gas, which is addressed further in Chapter 4.

4 Storage

The European energy system is in the middle of a transition. Next to large-centralised generation, several countries in Europe are experiencing a move to more decentralised, intermittent generation at an increasingly local level. While this reduces the overall carbon output of electricity generation and increases participation in energy markets at consumer level, intermittent generation which is often connected at distribution level brings a new set of challenges for grid operators. Here, energy storage – as one of the sources of flexibility - is likely to play an increasingly important role for DSOs with respect to managing grid constraints. This chapter explores the technical applications of storage at distribution level, their associated benefits for the grids and the regulatory challenges which arise from their use.

4.1 Storage technology

CEER underlines that in all cases storage is to be regarded as one source of flexibility at distribution level. All types of flexibility should be evaluated on a technology-neutral basis. By default, the DSO should seek to procure flexibility services from the market.

For the purposes of this chapter, energy storage shall be defined using a consolidated definition provided for the draft Electricity Directive text of the Clean Energy Package: *'energy storage' means, in the electricity system, deferring the final use of electricity to a later moment than when it was generated or the conversion of electrical energy into a form of energy which can be stored, the storing of that energy, and the subsequent reconversion of that energy back into electrical energy or use as another energy carrier.*[9] In addition, the Electricity Directive spells out that by default storage facilities shall not be owned, developed, managed, or operated by DSOs. This is due to such services being identified as market-based and competitive activities. Therefore, the risk of cross-subsidisation between storage and the regulated function of distribution or transmission of electricity must be minimised. These restrictions on storage ownership aim to prevent distortion of competition, eliminate the risk of discrimination, safeguard fair access to flexibility services to all market participants, and foster effective and efficient use of flexibility, including storage facilities, beyond the operation of the distribution system. However, there are circumstances in which DSOs can get involved in storage-related activities. For this to be permissible, the relevant regulatory authority must be satisfied that an open and transparent tendering procedure was followed, and that the storage facilities are required for the DSO to fulfil its obligation to operate an efficient, reliable, and secure system.

Energy storage technology can provide a multitude of benefits to the electricity system. These vary across different timescales, from seasonal storage (where surplus power generated from renewables may be carried over into another season where less renewable generation is usually prevalent) to voltage support services which require injection or removal of power at millisecond intervals to maintain voltage. As explored later in this chapter, there is also considerable potential for carbon savings by displacing conventional diesel generators in specific operational scenarios.

[9] Proposal for a Directive of the European Parliament and of the Council on common rules for the internal market in electricity (recast), 11 January 2019 version, Art. 2 (47).

Energy storage can provide benefits to both consumers and grid operators. For the final consumer, it can provide greater flexibility as to when they can use electricity generated on site or electricity imported from the grid. For grid operators the technology becomes relevant to provide grid support, balancing, and peak shifting services which secure quality of supply within the parameters set out by NRAs.

Depending on the types of services required and the associated timescales for charging and discharging, different technologies are available to provide appropriate solutions. A comprehensive overview of energy storage technologies is available from the Grantham Institute.[10] For example, peak shifting can be facilitated by 'classic' storage solutions such as pumped hydro which are commonly found across Europe. This technology has been in use for over 100 years and, whilst capital-intensive and only available at specific sites, provides a high degree of efficiency at relatively low cost per kWh. Traditional peak shifting has mainly been driven by wholesale electricity prices and not by local congestion management. At the opposite end of the spectrum, batteries are fast becoming the technology of choice for commercial storage solution providers. Whilst deployment in some countries is still slow due to regulatory uncertainties, these are characterised by high degrees of efficiency and moderate capital costs which have observed a significant fall in recent years. The mobile nature of such batteries also makes them more practical to install when addressing issues occurring at lower voltage levels.

Although markets already exist for frequency response services, these are generally not relevant to DSOs. However, in exceptional circumstances DSOs may have a role to play where energy storage can be used as reserve power to respond to outage situations or deal with challenges in isolated parts of the network (stabilising frequency in islands networks)[11] Today, diesel generators are often used in these scenarios, but storage devices are likely to challenge their position due to better operating capabilities and a lower carbon footprint. CEER is clear that future regulatory frameworks are well advised to ensure that the technological benefits of storage are realised whilst minimising any potential for conflicts of interests for DSOs as well as any potential market distortions.

There are new services offered by energy storage technologies and other flexibility sources which need to be explored by DSOs and NRAs. These are related to peak shifting, peak smoothing, voltage support, and reactive power injection when dealing with power capacity or voltage quality constraints in distribution networks. The most relevant parameters related to power modulation, duration, rate of change, response time, and location must be identified. Here, DSOs should develop standards for different types of requirements which can support the development of standardised market-based mechanisms for procuring flexibility services, possibly with regulatory involvement. These may require refinement over time and should be specified in a technology-neutral manner so that they provide a solution to a given constraint regardless of where it occurs in the system. A similar standard for lease or service procurement may be required when flexibility is available behind a network user's point of connection.

[10] https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/Energy-Storage-Infographic-Grantham-web-080716.pdf

[11] This can also be the case of small isolated gas distribution networks where natural gas is delivered by LNG trucks to an LNG storage facility and then injected into the network after regasification.

In addition to circumstances where DSOs may make direct use of storage technologies, there are further system benefits to be realised in circumstances where energy storage behind network users' point of connection are the most cost-efficient solution to solve grid constraints. From a network perspective, it may often be more beneficial to have smaller distributed solutions, especially at lower voltage levels in long radial feeders. From a regulatory point of view, this should be deemed acceptable as long as the network users themselves, or service providers acting on their behalf, own and operate the storage solution. In such a scenario, the DSO effectively obtains the required services from the market. The challenge, however, is to determine to what extent DSOs should be allowed to incentivise network users to provide flexibility services by differentiating prices in specific locations according to the type of service required. DSOs and eventually regulators should also consider to what extent liability issues may impact the effectiveness of the market-oriented approach. There is a risk that with an increasing number of storage devices providing various technical services across the system, efficiency gains delivered by a market-based approach to network services are undermined as operating companies may increasingly look to insurers to cover cost risk for non-delivery of services.

4.2 Power-to-Gas

Given the on- and off-shore natural gas infrastructure across the majority of EU Member States is well-developed, the potential of Power-to-Gas (P2G) technology for an energy system that is undergoing a transition must be explored. Given the production fluctuations across renewables production, there is significant potential to store electricity generated which is produced at times of high renewable generation but cannot be used due to capacity constraints in the form of a gas (for example synthetic methane or hydrogen). Such operational practices are likely to contribute to an increasing share of renewables production to Europe's energy supply and thereby displace more conventional fossil fuels with carbon-neutral alternatives. This holds true both in case of storing renewable energy in gaseous forms and transporting it via the existing gas network to end-users or reconversion of such gases to electricity. The potential of P2G should therefore be entertained in the context of an increasing decarbonisation of the energy system.

P2G can be utilised as an integral technology for fostering integration of the gas and electricity sectors, in particular at the infrastructure level. A move towards more integration has the potential to facilitate a cost-efficient and accelerated transition to a carbon-neutral energy system. Against this background, numerous trials are under way across the European Union which aim to assess the potential of additional uses of gas infrastructure to facilitate an accelerated transition to a carbon-neutral power system. To facilitate such a transition, any future regulatory framework must allow for such technologies to make use of their potential on a level playing field, while being in full compliance with the principles of liberalised energy markets and unbundling.

Operators of natural gas networks may seek involvement in activities for which there can be competitive markets, like ownership, development, management, and/or operation of power-to-gas (P2G) infrastructure.[12] Where a combined provision of regulated and competition-based service provision is possible, the regulatory framework must ensure that customers and market participants benefit to the largest extent possible. However, regulation must prevent unintended interactions between the regulated and competition-based activities in terms of cost and revenue allocation, and information asymmetry. One way to address this

[12] See also Regulatory Challenges for a Sustainable Gas Sector, CEER Public Consultation Paper, 22 March 2019, Ref. C18-RGS-03-03.

issue is to replicate the prohibitory regulatory approach described in the Electricity Directive for DSO ownership, development, management and operation of energy storage facilities. However, exceptions may be permissible when there is no market interest to engage in these activities. A market test should take place using a tender process which has been approved by national regulators. Such an approach would be aligned with CEER's framework for DSO involvement in new services, described as 'activity allowed under conditions'.

4.3 Case studies

Norway
In Norway, the question of DSO ownership and operation of storage has created extensive debate. Given the nascent nature of the market for storage, the Norwegian energy regulator NVE has found it difficult to evaluate the grid value of flexibility provided by storage technologies. To overcome this challenge, NVE is incentivising national pilots where DSOs can both own and operate batteries as an alternative to traditional grid investments. The applications for storage are restricted as part of these pilots, primarily for resolving short duration capacity problems and poor voltage quality in long and weak feeders as they occur at the outermost ends of the network in scarcely populated areas. NVE suggests that a limited number of small stand-alone batteries can be beneficial to local grid conditions and should not have any significant impact on the energy market. When cost-effective batteries with improved charging and discharging capabilities become available, e.g. using larger grid installed storage systems or EVs, new regulations must be developed and implemented. The framework will have to account for both the grid and market value of such batteries to assure optimal solutions. It is highly unlikely that DSOs will be allowed to own energy storage systems in such circumstances.

Italy
Currently, Italian regulation foresees that no investment undertaken by DSOs in energy storage systems should be recoverable through distribution network tariffs, unless the DSO submits a proposal providing a cost-benefit analysis to the regulator that justifies such investments.

ARERA, the Italian energy regulator, commissioned an academic research[13] to devise a methodology to appraise investments in storage investments undertaken by DSOs, primarily concerned with their socio-economic benefit/cost ratio, considering different features in terms of distribution network topology and conditions, and load and generation profiles. The methodology was applied to medium voltage (MV) networks, which are statistically representative of various types of Italian MV networks.

The methodology considers the capital expenditures for the storage facility investment and seven benefit categories:

1. Deferred or avoided capital expenditures for network elements (e.g. revamping or substitution of lines and transformers);
2. Avoided curtailments of RES generation;
3. Reduction of energy losses;
4. Improvement of continuity of supply;
5. Reduction of reactive power exchange at the TSO/DSO interface;
6. Voltage dip mitigation;
7. Improvement of voltage regulation capabilities.

[13] Pilo F., Pisano G. et al, Assessment of Energy Storage Systems Installation in Smart Distribution Networks, AEIT International conference, October 2018. ISBN 978-8-8872-3740-5.

The analysis determined that a storage facility can be economically efficient (i.e. benefits overweight costs, over a medium-term horizon of 10 years), given the average distribution network topology in Italy and reasonable assumptions on load and generation profiles.

United Kingdom
In the United Kingdom, Ofgem has made changes to the regulatory framework to ensure the provision of storage-related services are a market activity unless very specific technical circumstances warrant DSO ownership and operation of storage assets. To that end, regulatory interventions have been made to classify storage as an activity of electricity generation and to disallow DSOs from generating electricity – thereby allowing for continued ownership of storage assets by DSOs but ensuring operation such assets are operated by third parties to avoid conflicts of interest. This new regulatory regime does however allow DSOs to operate assets with generation capability in very limited circumstances, for example on island systems and where storage assets are part of technical DSO operations (such as outage management or back-up power for operational centres), or indeed under an exceptions regime for which the DSO has to apply for, evidencing that a market test did not yield any third party interest and that DSO operation of the asset is the most cost-efficient solution.

4.4 Conclusion

Observations across Europe lead to the conclusion that CEER recognises the criticality of preventing conflicts of interest which may arise by DSOs owning and operating storage devices. CEER takes the position that storage-related services are to be provided by market-based entities and should become an entirely competition-based non-DSO activity.

In certain circumstances, regulatory frameworks may seek to develop a view to which extent DSOs should be incentivising behind-the-meter solutions through which they then obtain grid-related services. In principle, the regulatory framework across Europe is clear that any grid support services should be provided by independent market parties. This is to ensure that conflicts of interest are minimised as DSOs have an inherent advantage over market providers due to information asymmetry and a lower cost of capital, usually supported by the regulated asset base.

Nevertheless, regulators recognise that there may be value in DSOs operating storage. This may be the case in specific circumstances where there is technical justification and the activity has received approval by the relevant NRA. This may be the case where the market for required grid services is still in a nascent state or technical limitations limit the provision of a market-based solution. However, it is important to underline that, in principle, any such arrangement shall be of a temporary nature while technological limitations or market failures are overcome.

Providing the relevant NRA has granted approval, DSOs can utilise new technologies such as battery storage for the provision of services which they are required to deliver within the remit of their core operations. As part of their core regulated activity, DSOs are required to ensure interruptions to electricity supply are minimised. Where outages and temporal technical constraints require DSOs to support their grid with local power injections, DSOs might be able to do so using battery storage. Such solutions, however, must always be temporal in nature.

5 Direct Services to consumers

In its position paper *The Future Role of DSOs*, CEER established that, in a liberalised retail context, DSOs should not carry out activities behind the meter. However, direct engagement with consumers (or third parties) could be possible, for example, to procure flexibility services. Another example of a core service provided by the DSO is the delivery of detailed consumption data to consumers, which originate from advanced metering and data handling technologies used by DSOs[14]. This is described with greater detail in Chapter 6 of this paper. While assessing new activities which could be developed by DSOs soon, even if not yet clearly defined, the provision of 'direct services to customers' is an area of pronounced interest to CEER.

In some cases, DSOs may offer specific services to consumers. This may be the case for metering services (subject to the applicable market model), initial connection procedures[15] (before the availability of an energy supply contract), emergency response actions, contingency restauration of supply[16] or special services for consumers with special needs (facilities of critical relevance, e.g. hospitals or individual consumers which depend on electrical medical equipment).

For the context of this chapter 'direct services to customers' are to be defined as *services rendered beyond the metering equipment which can be developed by DSOs and involve some direct engagement with the consumer*. These new services are made possible by the extensive use of digital technologies and enabled connectivity throughout the electrical system, particularly in low voltage networks. In the methodology proposed by CEER[17] for assessing DSO activities, such direct services do not necessarily form the core business of the network operators but may only be acceptable to be carried out by DSOs in certain circumstances and/or after careful justification.

DSOs, as natural monopolies, benefit from economies of scale and economies of scope in their activity, as well as privileged access to consumers and their data. This economic advantage can drive consumer benefit when DSOs provide certain services, exploiting synergies which may result in cost reductions for the system. This opportunity is targeted for exploitation by specific energy policy interventions, which allow DSOs to conduct certain activities beyond their core role. For that purpose, a formal derogation should always be issued before DSOs embark on the provision of such services.

Additionally, competition policy sets limits for the development of new services by DSOs. Under the supervision of competition authorities and energy regulators, DSOs are held to account to ensure competition in the energy services market is not impaired and no barriers for innovative services are established. To manage these risks, energy regulators should be closely involved when designing the framework which identifies permissible service activities for DSOs at both European and national levels.

[14] There are also examples where an independent data hub company provides these data to consumers.
[15] The connection procedure often includes an administrative service (presenting a budget to the customer related to the works needed in the network for connection and/or reinforcement). In Italy, for example, DSOs can interact directly with new connection promotors but not in the case of services requested by existing customers (which should be done via supplier).
[16] During large storms, wild fires or other large-scale phenomena.
[17] CEER Conclusions Paper on *The Future Role of DSOs*, Ibid.

While there are not many examples of explicit prohibitions for DSOs to engage in direct services[18] in European countries, CEER will analyse this area of sector innovation to determine whether a clearer regulatory framework is required to frame what activity may be permissible in the future as a new DSO activity.

5.1 The base-case: consumer-centric model

Throughout the EU, communication with consumers is key when placing them at the heart of the energy market. Although communication via a single point of contact could be performed by alternative service providers, in most cases this may be a role for the supplier. In this context, many of the obligations regarding information or engagement with consumers are placed on the supplier and not on the DSO[19].

In an era of smart grids and increased connectivity, some of these services can be enabled by accessing consumption data from the smart meter or DSO's IT systems. Smart meter data, complemented by other network information, can provide valuable insight for consumers regarding their use of energy and opportunities for revenue generation or reducing energy costs. This would concern relevant network data and – in Member States where applicable – data from smart meters. The data is provided either directly, through a central data hub or a decentralised data exchange platform - either in real time[20] or at regular intervals. There will be circumstances, however, when the DSO will incur costs when providing data to suppliers or other market actors. Such an activity may fall within the DSO's core activity as operator of the smart energy system; however, this should not foreclose opportunities for other market actors to provide valued-added data services. Chapter 6 of this document outlines further detail on data management and associated services.

As described above, cooperation between DSOs and the single point of contact is at the heart of the consumer-centric model, as DSOs provide services to that single point of contact which, in turn, provides a consolidated service offer to final consumers. This interaction between DSOs and the single point of contact is classified as a core DSO activity. CEER is clear that processes surrounding smart grids and demand response should be of a consumer-centric nature[21].

DSOs may also offer services outside of their core role such as consultancy or third-party operation and maintenance of electrical facilities. For example, in Spain, the operation and maintenance of private power lines (links between single customers and the distribution network) is the responsibility of the relevant customer. Here, consumers can contract the service directly from the DSO (such activity would be outside of the DSO's core duties, but still subject to the scrutiny of the NRA and the competition authority).

It is also possible for consumers to become a market participant in as much that they participate directly in the market by providing grid services or generating power themselves.

[18] Mandatory separation between distribution and supply activities is, of course, a strong restriction.
[19] CEER Guidelines of Good Practice on Electricity and Gas Retail market design, with a focus on supplier switching and billing, 24 January 2012, C11-RMF-39-03.
[20] In many countries, consumers can access real time data through a direct link (communication port) with the smart meter.
[21] CEER Guidelines of Good Practice on Electricity and Gas Retail market design, with a focus on supplier switching and billing, Ibid.

5.2 Energy efficiency advice and campaigns

The energy services market is a driving force for innovation and added value for electricity and natural gas consumers. In mature markets, these energy services companies (ESCOs) are closing the gap between best practices and innovative technologies, and consumer habits and decisions.

While there can be exceptions, the general rule should be to keep DSOs away from this activity. Providing information to consumers is an activity performed by suppliers. There are several obligations (both in EU and national legislation) relating to the provision of information to consumers by suppliers in topics such as consumption data, energy labelling, consumer rights, energy efficiency and others.

Nevertheless, Member States[22] have previously opted for promoting broad campaigns on energy efficiency and demand response[23]. Due to their coverage of the wider consumer base, DSOs have been called upon to participate in such campaigns and to engage with consumers as part of such campaigns.

Furthermore, DSOs have also been incentivised to promote energy efficient behaviours in consumers as a way to optimise network investment or reduce energy losses (which are capital concerns of network operators). DSOs have previously developed or participated in campaigns for the promotion of energy efficiency, engaging directly with consumers. For instance, in Portugal, DSOs have applied for an energy efficiency funding programme[24] to roll out energy audits and install energy efficiency devices in street lighting where their concessions include provision of street lighting infrastructure.

While general information about best practices in energy use can be provided by DSOs, this is not a direct service to consumers in the sense that it cannot be charged to an individual consumer that contracts the service. On the contrary, DSOs should not provide energy audits and other energy efficiency services directly to consumers.

5.3 Flexibility services

Flexibility services have the potential to provide value across the energy system (markets and networks). The provision of flexibility can be the result of a wide range of system signals, from price-based time-of-use tariffs or critical peak pricing to contractual-based direct load control instructions (which may be automated)[25]. DSOs should be involved mainly by procuring flexibility resources in the distribution system.

In the short term, some new flexibility services may require a more direct engagement of DSOs with consumers. This may be due to the implementation of services within a pilot project framework, the small-scale and local specificities of the services provided, or that the services are provided close to real-time with strict specifications.

[22] EU policy also points to public campaigns and advice about energy services, such as Directive 2012/27/EU. This Energy Efficiency Directive establishes that suppliers or DSOs shall make available to their customers general information about where they can obtain advice on available energy efficiency measures for example.
[23] Several examples of energy efficiency programmes are presented in *A Description of Current Regulatory Practices for the Promotion of Energy Efficiency*, a publication of ICER in 2010 (ref. I10-CC-02-04).
[24] *Plano de Promoção da Eficiência no Consumo*, ERSE (ERSE's Programme for Energy Efficiency Promotion).
[25] CEER Advice on Ensuring Market and Regulatory Arrangements help deliver Demand-Side Flexibility, 26 June 2014Ref. C14-SDE-40-03.

In the United States, there are several examples of direct load control programmes managed by network operators[26]. Some European R&D projects also target such services, such as the UPGRID[27] project or the LINEAR project[28]. In Portugal, a DSO is currently piloting a service of rapid supply restauration in contingency circumstances through remote limitation of maximum demand in consumer homes. Small-scale PV or wind generators could be actively controlled by the DSO in order to provide flexibility services via the customer's behaviour. The LINEAR project also investigates this model. CEER finds it important that, in the end, network users can take their own decisions on how to provide flexibility services to either DSOs or the energy market.

A DSO's engagement with network users also applies to dispersed producers (or self-consumers), specific electrical charging devices like EV charging points or storage operators. With sufficiently developed energy markets and with effective Information and Communications Technology (ICT) systems supporting those flexibility services, the relationship with the consumer (or prosumer) should be routed via suppliers or other demand-response actors, like aggregators, instead of DSOs. Besides taking the role of representation or interface between DSO and individual network users, aggregators can also bundle small-scale flexibility resources of several consumers in order to emulate a bigger network user and act as one virtual user. It is worth mentioning that DSOs will act, presumably, as facilitators of flexibility services – e.g. in providing relevant network information to market players - and as buyers of such services.

5.4 EV Charging

Electric mobility is progressing rapidly across Europe with many countries and companies planning and implementing EV charging infrastructure. This infrastructure can be built in a competitive market environment. DSOs should treat EV charging infrastructure operators as they do with any other network user.[29] The following chart provides a concept of contractual relationships among different subjects that are active in EV charging activity.

[26] The reference 2012, Ahmad Faruqui, Direct Load Control of Residential Air Conditioners in Texas refers to certain examples of direct control of residential loads.

[27] The UPGRID project developed and validated solutions to enable the implementation of advanced functionalities over existing technology, including monitoring and control of low voltage and medium voltage grids, anticipating technical problems associated with large scale integration of distributed energy resources (link: http://upgrid.eu/).

[28] The LINEAR project investigated new ways to improve energy flexibility by consumers (link: http://www.linear-smartgrid.be/)

[29] See the CEER Public Consultation Paper, The Future Role of DSOs,16 December 2014, Ref. C14-DSO-09-03.

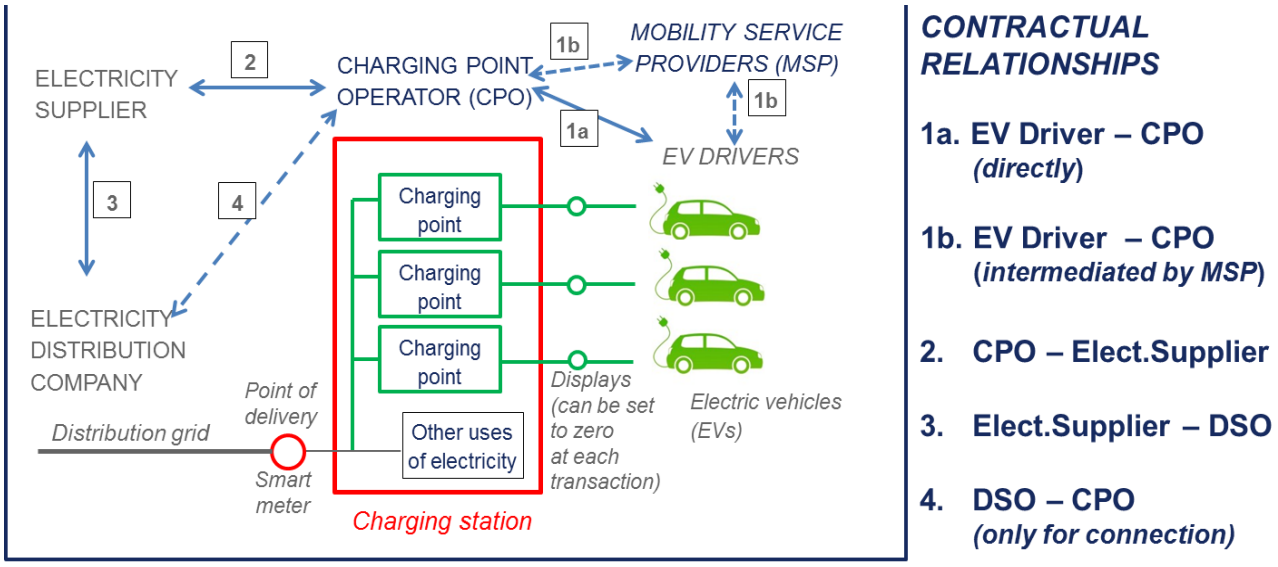

Figure 2: Contractual relationships for recharging of electric vehicles

The Charging Point Operator (CPO) should be seen as the "final customer" of the power system (or as a "prosumer" in case of vehicle-to-grid (V2G) services), with charging being a service in itself. This implies that the CPO has an ordinary contractual relationship with the electricity retail supplier and the DSO considers the whole station as a single point of delivery. Therefore, EV users do not require any contract with the supplier to the CPO; EV drivers can either enter into a transaction with the CPO or with a "mobility service provider" (MSP) which may act as an aggregator for charging services. This approach is fully aligned with the provisions of the Directive 2014/94/UE that is based on the idea that "*the establishment and operation of charging points for electric vehicles should be developed as a competitive market with open access to all parties interested in rolling-out or operating charging infrastructures*"[30] and explicitly requires that "*Member States shall ensure that distribution system operators cooperate on a non-discriminatory basis with any person establishing or operating charging points accessible to the public*".[31]

EV charging points, and EV themselves, may be used to take an active role in the power system, providing flexibility services. There are projects for such flexibility service provisions which include renewable generation (e.g. rooftop PV), storage (for instance, as a second life for used EV batteries) and flexible demand (controllable EV charging or "smart charging").

DSOs should facilitate the participation of such infrastructure in the provision of flexibility services alongside other flexibility providers. DSOs can then procure flexibility for network operation in order to resolve network constraints.

CEER supports the prohibition of DSO ownership/operation of electric vehicle charging infrastructure[32]. The provision of DSO services directly to EV owners should not be allowed except for special circumstances (such as a DSO-owned EV fleet). It should be permissible

[30] Directive 2014/94/UE, recital 29
[31] Directive 2014/94/UE, art. 4(11)
[32] European Energy Regulators' White Paper # 2 *The Role of the DSO,* about European Commission's Clean Energy Proposals, 15 May 2017.

for DSOs to own EV charging stations within their company premises where such stations are solely used to 'refuel' the company's EV fleet. In some countries, early development of EV charging infrastructure has led to DSOs building and operating such infrastructure. This is the case in Luxembourg with the "Chargy" project[33] where "charging service suppliers" provide their customers with access to the DSO's charging infrastructure and are responsible for customer billing. The charging service suppliers can fix their prices freely. The DSO sources the electricity through a public tender, which is conducted every three years. DSOs are also directly involved in EV charging in certain pilot projects (such as the already mentioned LINEAR project) or studies for network development (as is the case in Germany where a DSO provides EV infrastructure to private customers in order to gather data on private EVs within their network to improve consumption forecasts as part of a pilot project).

5.5 LNG/CNG refuelling infrastructure

The increasingly important role of CNG/LNG in transportation has led to an increased provision of LNG/CNG refuelling infrastructure, including the CNG/LNG refuelling station and the compression equipment to convert natural gas to CNG. CEER notes that DSOs should not be involved in such investment activities where a contestable provision of services is possible which can provide for sufficient geographical coverage and competitive pricing.

Nevertheless, it should be allowed for DSOs to own CNG stations within their own premises where such stations are solely used to 'refuel' the company's CNG fleet. The provision of refuelling station services and CNG/LNG transportation are contestable activities and can be provided in a competitive environment. In the process of ensuring sufficient coverage of the territory by CNG/LNG refuelling stations, these activities could require regulation by the competent authorities. Such an approach would require explicit justification on the basis of specific circumstances and benefits of involvement of the gas network operators in contestable activities. Nevertheless, the fundamental principle of unbundling related to cost and revenue allocation, and use of business information remains valid here.

LNG, as a versatile fuel, can be transported via trucks and can be used to supply remote areas and to secure gas deliveries to consumers. The use of LNG in the transportation sector also contributes to increasing competition in the market for transportation fuels by adding a new product to the fuel portfolio. A DSOs' role should not include distributing LNG[34].

5.6 Conclusion

DSOs traditionally offer services directly to consumers for operational reasons; examples are metering services, initial connection procedures, emergency actions, contingency restauration of supply and consumers with special needs.

Apart from these specific examples, DSOs should, as a rule, not offer direct services to consumers. At a minimum, the DSO's involvement in market-based activities should require a formal permit following an evaluation of clear conditions and provision of careful justification. This ensures that the development of the energy services market is facilitated through the DSO as a neutral market facilitator[35].

[33] https://chargy.lu/en/
[34] There examples, e.g. in Portugal, where natural gas suppliers also deliver LNG directly to consumers' installations in small cryogenic trucks.
[35] CEER Conclusions Paper, *The Future Role of DSOs*, Ibid.

CEER advocates for a consumer–centric model in the design of the energy retail market. In this scenario, DSOs have a central role in providing access to relevant network data and smart meter data where applicable; as well as in procuring flexibility resources which can be marketed by suppliers, aggregators, ESCOs or other agents.

It is common that a DSO's total coverage of energy consumers is used by authorities in information campaigns. CEER believes that while there can be duly justified exceptions, the general rule should keep DSOs away from such commercial activity because the provision of information to consumers should be performed by suppliers.

DSOs should be incentivised to use the available flexibility resources in the distribution system if they can economically prevent more-costly new physical investment or reduce network constraints. These new flexibility services may require entities like aggregators.

In the case of EV charging stations, flexibility services can be facilitated in the form of "smart charging", vehicle-to-grid services, or even through energy storage available on site. In this context, CEER underlines the prohibition of DSO ownership/operation of electric vehicle charging infrastructure or charging stations for natural gas vehicles. Nevertheless, the core role of the DSO should involve engaging with these new flexibility services providers in order to improve the distribution system operation and its overall cost efficiency.

6 Data management

Through their role in the electricity and gas system, DSOs are inherently exposed to and responsible for very large quantities of data. This concerns various network-monitoring technologies across the grid. In addition, in a number of MS this also includes data from smart metering systems. DSOs thus will inevitably collect and handle ever-increasing amounts of data. From the DSO's perspective, this data is primarily collected for operational and planning purposes, both near real-time and with a longer time frame.

Better observability of network performance and improved operational decision-making are not the only advantages of this rapid development. The access to power system data can be valuable to public and private commercial stakeholders alike. In particular, it can foster the development of novel grid and market services, and drive the utilisation of flexibility potential of customers and new technologies. CEER emphasises that across MS there are different approaches on the actors providing data (i.e. it is sometimes a DSO but sometimes a different actor) or the way this is provided (e.g. through a central data hub or directly by the actor responsible for metering operation via a defined data interchange process). In any case, providing access to relevant data in a secure and convenient way to relevant stakeholders will become ever more crucial in the future. This poses new challenges regarding the role of the actors responsible for data management, for example DSOs and/or a central data hub operator, in accordance with the national arrangement.

CEER's *Review of Current and Future Data Management Models*[36] establishes five guiding principles with seven recommendations for customer data management. The guiding principles aim to safeguard the security and privacy of customer meter data while assuring transparency and accessibility in a non-discriminatory way for the customer itself and market participants acting on the customer's behalf. This is also stated in Art. 34 of the draft Electricity Directive[37], and is concurrent with CEER's review. Where the DSO performs a related activity, as always it is expected to act as a neutral market facilitator. In addition, the CEP encourages the creation of platforms for consumption data accessible to eligible parties to engage market players in offering innovative services. The CEP is generally favourable to the creation of such platforms and stresses the importance of these being managed in a neutral and non-discriminatory way. Depending on the national context, when a data platform is in place the responsible party for this can be the DSO, but such data hubs or platforms could also be managed by TSOs or other neutral third parties. The form of data handling solution is strongly dependant on the national context, and CEER acknowledges that central data hubs or decentralised data exchange platforms can be, but are not always, the chosen solution. CEER's *Review of Current and Future Data Management Models* includes a broad overview of different models applied currently or in the future in different countries.

[36] CEER Review of Current and Future Data Management Models, 13 December 2016, Ref. C16-RMF-89-03.
[37] Draft Electricity Directive, Ibid., 11 January 2019.

While metering data is the focus of the CEER review and Art. 34 in the CEP's Electricity Directive, provision of other power system or grid related data might benefit both customers and third parties. Policymakers and CEER share the objectives of improving distribution system operation and planning, in addition to providing energy efficiency improvements by processing and utilising all forms of relevant information. There is a distinct divide between network and consumption data in terms of ownership. The former belongs to the DSO and the latter to the consumer, but DSOs must always be able to use consumption data to perform their core tasks (taking appropriate privacy protection steps). DSOs, where this is provided for in the national regulation, ought to have a facilitating role with commensurate responsibilities as data managers, regardless of this distinction.

6.1 Data management - the potential role of DSOs

Where the overall market developments push DSOs further into the role of market facilitators for data, it is increasingly important to understand how and to what extent DSOs should feed data to different types of stakeholders. The separation between activities of providing data to the market and providing competitive data analysis services may not always be clear, especially when it comes to providing an increasing range of commercial and technical data to a wider range of stakeholders.

With regards to meter data, smart metering systems are enabling DSOs, where they are responsible for metering, to serve the market with a new level of data quality. Consumption and production data, in many cases, may be recorded in the same timeframe as wholesale markets operate. Subject to the consumer's consent, this data can be made available to suppliers, aggregators or other service providers with an inherent time delay (due to collection and validation processes). Availability of quality-ensured data can facilitate new products, such as dynamic retail energy prices. Providing energy companies (e.g. suppliers) with raw meter data is a core task of DSOs where they are responsible for metering and can be achieved through various channels depending on the market structure.[38]

As well as meter data, DSOs also have access to other types of data that is of increasing importance to various actors in the energy market. This can be data on the connection point of the customer, but it could also be the case that the DSO has more specific information, such as the type of business activities undertaken by commercial consumers. The latter is relevant meta-data to cluster different types of customers. Such customer groups, given sufficient anonymisation, can be used to analyse consumption patterns on a level of detail DSOs have not applied before. Such datasets could, in addition to and possibly combined with smart meter data, be of interest to many commercial actors, provided that privacy requirements for personal data are fulfilled. In addition to the regulatory questions on whether DSOs should be allowed to offer data analysis services based on consolidated datasets that they gather through their public service obligations; such new activities would raise concerns around privacy and data ownership.

[38] CEER Review of Current and Future Data Management Models, Ibid.

DSOs also collect and analyse technical data about their networks, such as voltage behaviour, load factors, power quality, grid resilience and capacity. DSOs traditionally took a "fit and forget" approach while connecting new customers to the grid. In most cases, they did not continuously analyse the state of their networks in detail unless problems occurred. This is starting to change. Smart grid technology provides options to monitor grid behaviour with a new level of quality. Detailed technical data on different grid states are a prerequisite for DSOs to source services from a third party to defer or avoid physical investments. Potential providers of such services will need to receive insight into grid needs in order to develop relevant products and services. While DSOs are only beginning to develop in-depth grid monitoring in most countries, it is the ability to understand their own needs and communicate these to service providers which may become a new service for other actors or evolve into a core activity for DSOs in the medium-term.

The increasing amount and diversity of data DSOs can provide to various stakeholders may not be of equal use to all. In the next sections the specific needs of different types of stakeholders are identified and analysed in more detail, and a distinction is made between individual and aggregated data. The most relevant categories of stakeholders are network users connected at the distribution interface, in addition to commercial and public stakeholders. Commercial stakeholders, or service providers, mainly consist of retailers, aggregators, energy efficiency service providers and software developers in this context, while public interest includes authorities, media, researches and similar entities.

6.1.1 The DSO's role with respect to individual data

Metering data provide individual load profiles and potentially information on power quality at a connection point. As this data is measured with sampling rates in the range of a few seconds to averaging over an hour, the data become more locational and time specific, and thereby more sensitive. Questions regarding relevance and ownership of power quality data and connection characteristics on an individual level should also be highlighted because there might be different and evolving needs for stakeholders in this area beyond the consumption data. These are mainly technical grid conditions on reliability and voltage quality made available through the meters, in addition to stipulated capacity data, provided by the DSO or electricity supplier.

For network users with specific requirements in regard to power quality, or where they are willing to become more active in the power system, for instance by actively managing their demand, such data can be essential. In Norway, DSOs are mandated through quality of service regulations to, inform network users about the number and duration of outages, the margins of different voltage quality parameters and the estimated minimum and maximum short circuit current at their connection point, if requested.

Some DSOs have, by choice or by mandate, and where foreseen by national legislation, gone one step further than the simple provision of raw meter data to customers and market actors; they have added an additional service or analysis to the data they provide. These may include a data platform with a user interface, or services to customers, such as support for energy efficiency, by providing comparisons with similar customers or by detecting unusually high usage. This is, for example, the case in France, where DSOs are required to inform customers about unusual spikes in their consumption where the consumers themselves define the threshold. While the French DSOs are mandated to provide this service, under alternative legislative regimes, such a service could be marked as an additional service to customers.

In a possible transition towards capacity-based tariffs DSOs could play a role in consulting customers on the capacity that they require. A correct capacity subscription on power outtake is important to both parties. The DSOs could use the subscriptions for planning purposes while the customers will want their tariffs to be as reflective of need as possible based on their load demand or available grid capacity. Advising customers on the capacity they should subscribe to is in principle an activity that any commercial actor could do in a competitive setting. However, in this case, it can be seen as a means to facilitate the possible introduction of a new tariff system and thereby might fall under activities allowed for DSOs under certain conditions. This one-off advice by DSOs would have the potential to create an awareness for grid capacity requirements among network users, allowing the retail market to develop. While there may be good reasons to mandate DSOs to provide advice in specific cases, a generalisation of these data related services should be treated carefully, given that these can be part of the offer of energy service providers. The risk that competition is foreclosed or distorted if a regulated entity like a DSO intervenes in a potential competitive activity must be addressed. In markets with a single point of contact structure, where DSOs may not have the position to directly interact with customers, an alternative approach would be a transition period for introducing capacity-based tariffs. One option would be that during the transition period (consisting of an adequate number of billing cycles), the capacity tariffs themselves would not yet be charged, but the consumer already would get information about its capacity-based values.

6.1.2 The DSO's role with respect to aggregated data

The increased quantity, granularity and quality of data available to DSOs creates an opportunity to consolidate data in ways that can be useful to a variety of stakeholders for different commercial and non-commercial applications.

Aggregated consumption and production data can help service providers to better understand the behaviour of various types of network users. Such datasets can, for example, help aggregators understand the potential for flexibility of different customer groups or help energy efficiency service providers compare their customers with those of their peers. It can also be used by suppliers to better predict consumption and production patterns, which becomes particularly important in markets where clearing occurs based on individual load profiles as opposed to standard load profiles. It can also help new-entrant suppliers close the knowledge gap compared to their larger competitors.

The entity that consolidates such data needs access to the metering data as well as detailed information about the customer. Where DSOs are responsible for the collection of metering data, and they already handle all the sensitive data required, there are no likely additional privacy concerns. Alternatively, where data hubs are in place, the provider of a data hub can provide such data sets as an additional service. Such a data hub or a platform for data exchange ensures a homogeneous and non-discriminatory approach across different DSOs.

An example where DSOs already take on such tasks is France, where municipalities can obtain data on the consumption within their jurisdiction from the DSO. Some data sets are also available to the general public via the country's largest DSO's open data portal[39]. Energy data is part of open data portals in an increasing number of countries and is not only of use to public authorities, but also to the academic world, to statisticians and to interested members of the public.

[39] http://www.enedis.fr/open-data

However, in-depth knowledge about the load patterns and topology of the grid may expose potential grid weaknesses and may potentially be sensitive from a security point of view. The extent to which such data should be made public, and the form in which it should be made available needs to be considered carefully. Such concerns may shape the extent to which DSOs should be required to make available raw data opposed to data needed for specific services.

Certain stakeholders may have more specific needs, which require more detailed analysis. DSOs have unique insight into the raw data needed to provide this analysis which can be aimed at defining grid needs. It can further facilitate the understanding of customer behaviour and the potential of customers to participate in different energy markets, individually or as a group. The role of DSOs in making use of this data is currently evolving.

In some MS, DSOs are ideally placed to provide such data to the market in a neutral way, and to facilitate the development of new business models. In some MS, centralised data hubs have been established to carry out this task in a neutral and non-discriminatory manner. Market development can especially be facilitated where, until these changes take place, historical energy data only has been available to a limited number of players and new entrants face a lack of visibility.

Furthermore, data analytics is a commercial activity for which a well-established and thriving market already exists in many sectors. DSOs have an obligation to provide metering data to their customers under European law, and customers that are interested in understanding their opportunities in the energy sector should be able to find providers that can analyse their data in a meaningful way. In this scenario, the role of DSOs could remain limited to the provision of raw data.

If DSOs were to provide data services, there is a question whether this would occur in the form of a commercial service provided to interested parties on a non-discriminatory basis, or if such analysis based on data gathered through a public service obligation and in view of improving market conditions, should be financed by grid tariffs.

Consolidated energy system data become most useful when coupled with additional information such as weather or socioeconomic data of the concerned areas. Such data coupling goes beyond the natural realm of DSOs. In some cases, the entity that deployed a data portal facilitates such analysis by providing an application layer, where the data managing entity does not necessarily provide the analysis. Customers can give third parties access to their data through the hub interface. Third parties can then use this data to provide services to their customers through analysis of individual or aggregated data. This is for example the case in Norway and Estonia, but in both cases, the platforms are operated by the TSO.

Aggregated data on grid conditions and power quality can serve DSOs' internal need to understand where service issues may arise, and investments may be required. With an increasing drive to use grid services as an alternative to grid investments or as a way to defer those investments, consolidated grid data can be used to understand the services required. Interpreting such consolidated grid data and the needs of the grid will increasingly become a core task of DSOs. This knowledge will be required to develop the market-based mechanisms to source the solution for grid issues. While a service industry may develop around the design of grid management solutions, it is likely that the specification of network needs will remain the core task of the monopolist grid operators.

6.2 Conclusion

DSOs have a monopoly position as owners and/or operators of electricity and gas distribution infrastructure, and they have access to vast amounts of data. These can be put together in unique sets containing detailed information about network users and grid characteristics, either at an individual or an aggregated level. Making data available to various stakeholders, with sufficient anonymisation and/or users' consent, will be an increasingly important task. Providing technical data at the network users' specific connection point should be mandated in a similar way through user consent as making available consumption data. However, any provision which goes beyond the provision of data at the network user interface is a potential competitive activity and can distort, rather than facilitate, relevant markets.

In those national contexts where the DSO acts as a data provider, it is crucial for them to ensure that privacy and security concerns are safeguarded. DSOs will be responsible for developing an adequate mechanism for data sharing by cooperating with data protection and information security agencies, especially when defining the sensitivity of power system data at different granularities. NRAs, TSOs and other relevant parties should be further involved in this activity. If data is neither sensitive to network users nor necessary to system operation, it is (considered) a public good.

Access to quality data at all interfaces, in combination with improved monitoring capabilities throughout the grid, will make it possible for DSOs to better understand their needs. All data in the DSO's possession which is essential to system operation must be allowed to be used for operational purposes. This requires DSOs to develop data analysis expertise.

Providing analysis services to network users or selling enriched data to third parties is not permissible. However, the former can be allowed under conditions if it is considered as a means to an end in the public good. Possible cases are related to guidance during the roll-out and implementation of smart meters, introduction of new tariff structures or national targets for energy efficiency. All activities allowed under conditions require the explicit consent of and close follow-up by NRAs.

7 Telecommunication and services outside of the energy sector

In this last chapter, CEER elaborates its views on services outside of the energy sector by the DSO. Services in the telecommunication sector have been selected to give a useful example for such services[40]. Here, CEER will address some considerations and implications of DSOs being active outside of the energy sector and – more specifically – within the telecommunications sector, before applying the framework laid down in chapter 2. However, CEER will first describe what it means by telecommunication activities by the DSO.

7.1 Telecommunication activities by DSOs

CEER distinguishes roughly three categories of telecommunication services, although these may consist of various different subcategories.

Firstly, there is the case where part of the existing distribution system is used as a passive infrastructure for hosting telecommunication lines owned by telecoms operators. An example would be assets (e.g. high voltage towers) upon which the DSO allows telecommunication operators to install antennas or telecommunications lines (e.g. optical fibre). In this example, the distribution grid is not used for the transport of signals through the grid, but rather is used for its height and/or geographical location. That means there is no impact (or very limited one restricted to physical aspects of network management) on the distribution grid itself.

Secondly, there is the situation in which the DSO provides services to telecommunication operators that it also uses to carry out its own exclusive tasks. A DSO might, for example, use optical fibre for communication within its grid as well as for purposes of operating the distribution grid. The question arises whether a DSO is allowed (or even obliged) to offer access to optical fibre to telecommunication operators and other parties. A similar example would be a DSO using a certain communication frequency for operating the grid, which might also be useful to telecommunication operators. or to third parties to communicate.

A third category for consideration is the situation in which the DSO does not merely provide these services to telecommunications companies through its existing grid or grid-related activities, but actually develops telecommunication infrastructure for the purpose of actively offering telecommunication services itself to other parties.

All in all, there is a range of services related to telecommunication that DSOs can offer. This ranges from closely related to their grid or supporting their own electricity or gas network operations to actively providing telecommunication services itself. This latter activity would clearly be a service outside of the energy sector.

[40] At the time of publication of this report, the implications of a provision of Art. 31 of the 11 January 2019 draft Electricity Directive relating to activities of DSOs outside their core tasks in the electricity sector has not yet been fully analysed by CEER with respect to its potential limiting effect on non-core DSO activities. The provision in question foresees that Member States, or their designated competent authorities, may allow DSOs to perform activities other than those provided for in the draft Electricity Directive and the draft Electricity Regulation where such activities are necessary for fulfilling the tasks provided for in said legal texts, and NRAs have assessed the necessity of such a derogation.

7.2 DSOs outside of the energy sector

First of all, NRAs should observe national legislation to answer the question whether DSOs are allowed to be active outside of the energy sector at all. Some Member States take a liberal approach, based upon the unbundling regime. The unbundling regime of the 3rd Energy Package states that where a DSO is part of a vertically integrated undertaking, it shall be independent at least in terms of its legal form, organisation and decision making from other activities not relating to distribution.

The primary aim of unbundling is to prevent vertically integrated enterprises from extracting advantages from having a monopoly DSO within that vertically integrated entity, e. g. by cross-subsidisation or information advantage. Therefore, unbundling is a structural legal framework for separation from other activities in the energy sector to prevent an abstract potential for discrimination of other parties in the energy markets. With this view, other non-core activities outside the energy sector could be allowed for DSOs, as this would not conflict the unbundling regime and European legislation does not contain a strict obligation for MS to implement legislation restricting the activities of the DSO other than the unbundling rules.

In the current legal system, Art. 26 of the EU Directive 2009/72/EC of the European Parliament and of the Council states that DSOs shall be independent from other activities not relating to distribution. As a Directive is a legislative act that sets out goals that all EU countries must achieve via implementation into national legislation rather directly (as with a Regulation). MS are allowed to make stricter statutory provisions when implementing a directive into national law. That implies that MS may allow or disallow DSOs to provide telecom services.

Thus, a MS may hold a more stringent approach, by which it imposes legislation on the DSO prohibiting the latter to carry out any activities other than (i) its core activities and (ii) activities related to their core tasks where the DSO has obtained approval to do so by the Member State or its NRA. This entails that any activities not directly contributing to the fulfilment of the core tasks are prohibited for DSOs within these Member States. The rationale behind this is that a DSO should focus exclusively on its core tasks and should not be distracted from that focus. Also, such prohibitions would prevent (undue) competition from an entity that holds a monopoly in a regulated sector in contestable markets.

The future European framework foresees a different approach for such services. Art. 31 (6) of the draft Electricity Directive (which would be finalised in the first half of 2019) states that Member States or their designated competent authorities may allow DSOs to perform activities other than those provided for in the draft Electricity Directive and in the draft Electricity Regulation where such activities are necessary for them to fulfil their obligations under those statutory provisions and the regulatory authority has assessed the necessity of such a derogation. The derogation for such services could lead, in some circumstances, to the conclusion that also telecommunication services could be carried out by DSOs.

A second point of consideration is that DSOs operating within the telecommunication sector are bound by the telecommunication legal framework, which might lead to conflicts with the energy sector´s legal framework. One example where such a conflict might arise is explained in the following two paragraphs:

DSOs own assets which are built and operated on the basis of rights of way. Therefore, one must refer to European Directive 2014/61/EU. According to this Directive, MS shall ensure that “passive” infrastructure operators (including electricity and gas DSOs) allow telecommunications operators to access this infrastructure for hosting broadband networks.

The price of this new service is not regulated, and each passive infrastructure operator shall treat specific requests from telecommunications operators, providing an offer. If the offer is considered too expensive[41] the telecommunications operator can appeal to the relevant body for resolving disputes. So, in this case, there is no conflict.

However, if the activity of a DSO goes beyond providing infrastructure for telecommunications operators to being a telecommunications operator itself, the legal framework for telecommunication is relevant for the DSO as well. But, all the obligations of the energy sector cannot be circumvented by DSOs in this case. That means if both legal frameworks do not fit together, a separate telecom company would need to be established or the DSO is likely to become the subject of litigation.

7.3 Applying the framework to telecommunication activities in general

Having described some specific considerations and implications for the case of DSOs being active in the telecommunications sector, CEER will now apply the decision framework of Chapter 2 to the telecommunications activities. CEER will take into account the considerations mentioned in the previous paragraph.

Telecom services are difficult to analyse in the light of whether this activity is allowed for DSOs or not. It depends on whether the MS choose to allow DSOs non-energy activities or not. In MS where any activity must be directly related to the core activity of the DSO, it will most likely not be allowed to be active in the telecommunication sector, as it does not contribute to the functioning of the distribution system. When MS have opted to allow DSOs to carry out non-energy activities, the conclusion that results from analysing the activities in the light of the framework depends on 1.) the development of the markets in that sector; and 2.) the impact of the activities on those markets where the DSO's monopoly position is relevant.

The CEER framework for DSO activities other than their core activities states that if an activity is currently carried out by another operator than the DSO and the market is sufficiently developed, it is a competitive non-DSO activity – DSOs are prohibited to carry out such activities. CEER does not have the capacity to comprehensively analyse market developments in other sectors. This task by its nature needs to be overseen by the relevant competition authorities and take a multi-sectoral approach. The fact that the telecommunications sector is still regulated throughout Europe where significant market power is found, is an indication that some telecommunication activities are not fully competitive. In this case, an additional entrant could contribute to promote competition in telecommunications market.[42] On the other hand, the few active market players could have a strong competitive position.

CEER emphasises that, if the telecommunications services are in some way permitted, the allowance must be under conditions. One elementary condition is an accounting separation of revenues and direct costs of these different activities of the DSO. DSO activities in competitive areas should not be influenced by cross-subsidisation, in essence being financed by the grid users and vice versa. This condition is also important to avoid DSOs´ using cross-subsidisation for optimising their results in the regulatory benchmarking process with other

[41] The main idea is to develop broadband telecommunications networks at lower cost (Directive 2014/61/UE is called "cost reduction directive" or CRD).
[42] However, competition could be reduced if the new entrant can use its monopoly power in another sector to its advantage in the telecommunications sector.

DSOs. Another condition would be that DSOs have to carry out these non-core activities in a non-discriminatory way. More conditions could be set up by legislation or by decisions of NRAs. NRAs may, for example, take into consideration the deterrent effects resulting from the presence of a natural and publicly-owned monopolist on a given market and the competitive advantage that it might have when obtaining funding. Additionally, a highly profitable commercial activity can disincentivise DSOs to fully focus on their (perhaps lesser profitable) core tasks. Such a loss of focus must be avoided.

It is important to emphasise that independent from the question whether DSO activities in the telecom sector are allowed or not, DSOs are obliged to allow telecommunications operators to access this infrastructure for hosting broadband networks in accordance with Directive 2014/61/EU. Where this detracts the operation of the distribution system, being the core task of the DSO, CEER holds the opinion that the DSO should not continue carrying out the telecommunication activity. While it may be feasible for the DSO to provide telecommunication services through the grid to one or two parties, given the rules on non-discriminatory access to telecommunication infrastructure, the DSO must handle all potential requests in a non-discriminatory manner. With more than a few requests, this may simply not be feasible.

7.4 Conclusion

There is no one size fits all-approach for NRAs to participate in non-core activities such as telecommunications even in the new European legal framework. First of all, it should be noted that national legislation on allowing DSOs to be active outside the energy sector can differ between MS. Further difficulties result from the fact that various aspects that have to be taken into consideration can be interpreted in different ways and might influence each other.

In any case, CEER believes that it is important for DSOs not to disregard their core DSO tasks. Where offering telecommunications services is in some way allowed, the allowance must be under conditions. It is also important to keep a clear separation of regulated energy activities from other activities to avoid cross subsidisation.

8 Conclusions

The transition to a decarbonised energy system[43] as well as technological development, particularly through digitalisation[44], have both led to changes in the current activities carried out by DSOs and creation of new activities, within or related to the energy system. For these evolving and new activities, where there could be involvement of DSOs, a basic question is whether DSOs should be allowed to undertake them or not. This topic has received considerable attention by legislators, for example in the Clean Energy Package, and by regulators, for example in CEER's Conclusions Paper on *The Future Role of DSOs*.

At the core of DSO activities lies the design, maintenance, development and operation of the distribution system. At the same time, this system is connected to other interfaces, such as the transmission network or to network users. It is important to distinguish what the boundaries of the distribution system are, especially in areas where developments can be expected. As example, power to gas is likely to become more prominent and can benefit from a clear definition of interface, to which grid operators and market actors can contribute.

The shift towards more decentralised, intermittent injection of energy in distribution systems requires grid operators to use sources of flexibility to manage their grid efficiently. One of the key flexibility technologies – storage – remains an important topic concerning DSO involvement. CEER recognises from observations across Europe the necessity of preventing conflicts of interest caused by a DSO owning and operating storage devices. There is clear evidence that storage-related services are to be provided by market-based entities and therefore, storage is considered as an entirely competitively activity. Nevertheless, regulators recognise that there may be value in DSOs operating storage in specific circumstances where there is technical justification and the market cannot (yet) provide flexibility and the activity has received conditional approval by the relevant NRA.

Besides a limited number of services that DSOs offer directly to consumers for operational reasons, such as emergency actions and, where applicable, initial connection procedures and metering services, in principle DSOs should not offer direct services to consumers. At a minimum, the DSO's involvement in market-based activities should require a formal permit following an evaluation of clear conditions and provision of careful justification. This ensures the development of energy services in a competitive market environment, which is facilitated through the DSO acting in a neutral manner. CEER advocates for a consumer–centric model in the design of the retail energy market. Through this approach, for instance, EV charging stations are 'beyond the meter' installations that must be run in a competitive environment. Other activities, such as specific energy efficiency advice and the provision of flexibility services can be carried out by suppliers, aggregators, ESCOs or other market parties.

[43] See CEER's 3D Strategy (2019-2021) Digitalisation, Decarbonisation, Dynamic regulation: CEER's 3D Strategy to foster European energy markets and empower consumers, Ibid., for CEER's outlook on decarbonisation and digitalisation.
[44] See Public Consultation Paper on Dynamic Regulation to Enable Digitalisation of the Energy System, Ibid.

Due to DSOs' monopoly position in the electricity and gas distribution infrastructure, they have access to vast amounts of data about network users and grid characteristics on both an individual and aggregate level. Making data available to various stakeholders, while safeguarding privacy and security, will be an increasingly important task. Providing technical data at the network users' specific connection point should be mandated in a similar way as making available consumption data. However, any provision which goes beyond the provision of data at the network user interface is a potential competitive activity and can distort, rather than facilitate, relevant markets. Depending on the national context, DSOs can be responsible for developing an adequate mechanism for data sharing, when data is neither sensitive to network users or necessary for system operation, as in that case it is considered a public good. All data in the DSO's possession which is essential to system operation must be allowed to be used for operational purposes. Providing analysis services to network users or selling enriched data to third parties is not permissible when this activity can also be performed by the competitive market.

With regard to telecommunications, CEER recognises that on itself DSOs require it for their network operation. However, offering telecommunications services to third parties could result in a situation of unfair competition in competitive markets. This also is an example of DSOs being active outside the energy sector. There is no one-size-fits-all approach for NRAs to act upon, due to differences in national legislation. Where DSOs would be allowed to offer services outside the energy sector, such as for example, telecommunication services, the permission must be under specified and appropriate conditions. In any case, it is important that the DSO does not neglect its core tasks and that a clear separation of regulated energy activities from other activities, for example, in order to avoid cross subsidisation, is maintained.

With this document CEER aims to provide more clarity in certain grey areas. In essence, CEER concludes that a market-driven approach should be used where possible, in order to avoid any undue influence from the monopoly position of the DSO in the energy sector. All activities allowed under conditions should require the explicit consent and close follow-up by NRAs. With the energy transition continuing, there remains a need for legislators and regulators to reduce uncertainties for both DSOs and all other actors in order to facilitate developments in market activities and regulated activities.

Annex 1 – List of abbreviations

Abbreviation	Definition
ACER	Agency for the Cooperation of Energy Regulators
CDS	Closed Distribution Systems
CEER	Council of European Energy Regulators
CEC	Citizens Energy Community
CEP	Clean Energy Package (Clean Energy for All Europeans package)
CPO	Charging Point Operator
DSO	Distribution System Operator
EC	European Commission
ESCO	Energy Service Company
EV	Electric Vehicle
GDPR	General Data Protection Regulation
GGP	Guidelines of Good Practice
ICT	Information and Communications Technology
IHD	In-Home Devices
MS	Member States
NRA	National Regulatory Authority
P2G	Power-to-Gas
PV	Photovoltaic
R&D	Research and Development
RAV	Regulatory Asset Value
RES	Renewable Energy Source
TSO	Transmission System Operator
V2G	Vehicle-to-Grid

Annex 2 – Roundtable on New Services Associated with DSOs

To gather insights from the many stakeholders in the energy sector on new services associated with DSOs, CEER organised a roundtable event on the topic prior to the completion of this paper. CEER would like to thank all the participants for their useful input. In this annex a short summary of the presentations and discussion is given.

CEER referred to its conceptual thinking on DSO activities from the *Future Role of the DSOs* conclusion paper. Specifically, CEER mentioned the role of the DSO as neutral market facilitator and the three possible outcomes for activities (allowed, not allowed and allowed under conditions). Also, CEER expressed the importance of further developing clarity in existing grey areas.

The EC presented the main highlights on DSOs in the Clean Energy Package, focusing on electricity as the CEP does not address gas-related issues for the most part. The EC emphasised the importance of the neutral role of the DSO. DSOs are allowed to use flexibility. On storage, the CEP created an article defining electricity storage for the first time. In principle, it is not allowed for DSOs to operate storage, however there is room for exceptions, which does include a review of market circumstances. For EV charging points a similar scheme is in place. On data, the central principles are a non-discriminatory approach and transparent access to data. The EC did not want to force a certain approach to data hubs on MS.

Dr Michael Pollitt[45] presented an academic perspective on the future of the DSOs and new services and grid management. Looking at DSOs across the world and in Europe in particular, the characteristics vary enormously, for instance with regard to size, voltage levels of the grid, private and public ownership. Also, the unbundling status differs, with perspectives on pros and cons on vertical integration and unbundling elaborated by Professor Politt. An area where more progress is needed is on ancillary services, for example, in the relation with energy markets and the interaction between TSOs and DSOs. With regard to local markets: they offer theoretical advantages but there is a question if they are sustainable and efficient in the long term.

Definition of interface and storage
CEER recognises the importance of the definition of interface in terms of the idea that as DSOs are allowed to undertake their core activities in owning and operating the grid, it should be clear what the boundaries are. There seemed to be a general consensus that boundaries are less clear now with changes in the system. In the roundtable, in addition to the physical interface, also the contractual and digital interfaces were discussed. Several stakeholders mentioned that smart meter communication can contribute in maintaining the grid and providing options for customers. Furthermore, the interface between energy systems was discussed, for example between electricity and gas. There are similarities, but also differences, as, for example gas does not have frequency and electricity does not have line packing.

[45] Professor of Business Economics, Cambridge Judge Business School, University of Cambridge, UK.

On electricity storage, CEER referred to the CEP where the basic parameters are set out. According to DSOs, the challenge in electricity is active system management, where knowing the grid and the interaction with third parties providing flexibility is key. Some stakeholders mentioned that DSOs should be allowed to own and operate storage under the condition that it is auctioned off to the market when the storage is not used for grid purposes. On gas storage it was mentioned that underground gas storage usually is not connected to the DSO grid. However, line packing at the DSO level might become relevant with an increase in renewable gas injection. Also, here there is a relation between electricity and gas through power-to-gas, which would have a different injection profile. In principle, sector coupling should be a market-based activity, where grid coordination is important to reach an efficient outcome.

Direct services and data management
For consumers there are considerable developments in direct services provided by different entities, especially in countries where the status of unbundling or market structures (e.g. supplier-centric) are changing. In any case, there remains a monopoly position for the DSO, which requires a neutral market facilitator role. Strong regulation is needed to avoid any kind of cross subsidisation and benefits for a supplier. In practice, DSOs notice that even in a supplier-centric model, consumers often contact DSOs with certain questions, for example technical questions when a private EV charging point is installed. During the roundtable, some DSOs stated that they do not want or need to be active in services "behind the meter" (such as smart home solutions) or in energy efficiency services.

There seemed to be a general consensus that data is valuable. The question who owns what data seems to be less straightforward. GDPR's requirements are clear on a consumer level. It is important that access to a customer´s data is only provided to those authorised by them. In that way, customers can give third parties access to their data. However, on an aggregate level there are more questions. There should be clear arrangement for data operation – who is providing which data to whom – in place. While there should be non-discriminatory and transparent access to data, security reasons for grid operation should be taken into account in the data provided to other market players. What also remains to be seen is if all DSOs will become data managers, which could depend on the voltage levels operated by the individual DSO. Inefficiency in data operation should be avoided.

Telecommunication and services outside of the energy sector
There seemed to be a general consensus at the Roundtable that digitalisation is a part of network operation. Digitalisation is important in light of smart meters and smart grids. Digitalisation can contribute to, for example, resilience and information to operate the grid efficiently. The question remains if DSOs should be allowed to provide telecom services to third parties, including consumers. The outcome could depend on the developments and needs in the telecom sector. For example, with the development of 5G it could be argued that it would be beneficial to (locally) provide access to DSO telecommunication networks in order to achieve network sharing.

Regulators and policy makers should be aware of the advantages and disadvantages of DSOs being active in the telecom sector. Advantages can include synergies and control over the network, including reliability. Disadvantages can be risk of cross-subsidisation and unfair competition. Separate accounting would be a measure that is required in that case. Regulation and legislation of different sectors are becoming intertwined, with potential contradictions or grey areas. This requires more interaction between regulators on energy, telecoms and competition. Also, DSOs should take into account the legislative requirements from all sectors when they seek to become active outside of the energy sector.

List of organisations represented at the roundtable:

Alliander
BEUC (European Consumer Organisation)
Body of European Regulators for Electronic Communications (BEREC)
Brugel
Bundesverband Neue Energiewirtschaft
CEDEC
CEER Secretariat
CEER/ACM
CEER/ARERA
CEER/BNetzA
CEER/E-Control
CEER/Ev
CEER/ILR
CEER/NVE
CEER/Ofgem
European Association for Storage of Energy (EASE)
EDSO for smart grids
Energy Community ECDSO-E
Energy Community Secretariat
ESB Networks
Eurelectric
Eurogas
European Commission - DG ENER
European Energy Retailers
European Telecommunications Network Operators Association (ETNO)
GEODE
German Association of Public Utilities (VKU)
Hafslund Nett AS
Iberdrola
Innogy
Methodia
National Energy Ombudsmen Network (NEON)
Orgalime
Regulatory Assistance Project (RAP)
Thüga
University of Cambridge
VREG

Annex 3 – About CEER

The Council of European Energy Regulators (CEER) is the voice of Europe's national energy regulators. CEER's members and observers comprise 38 national energy regulatory authorities (NRAs) from across Europe.

CEER is legally established as a not-for-profit association under Belgian law, with a small Secretariat based in Brussels to assist the organisation.

CEER supports its NRA members/observers in their responsibilities, sharing experience and developing regulatory capacity and best practices. It does so by facilitating expert working group meetings, hosting workshops and events, supporting the development and publication of regulatory papers, and through an in-house Training Academy. Through CEER, European NRAs cooperate and develop common position papers, advice and forward-thinking recommendations to improve the electricity and gas markets for the benefit of consumers and businesses.

In terms of policy, CEER actively promotes an investment friendly, harmonised regulatory environment and the consistent application of existing EU legislation. A key objective of CEER is to facilitate the creation of a single, competitive, efficient and sustainable Internal Energy Market in Europe that works in the consumer interest.

Specifically, CEER deals with a range of energy regulatory issues including wholesale and retail markets; consumer issues; distribution networks; smart grids; flexibility; sustainability; and international cooperation.

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More information is available at www.ceer.eu