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The Changing World of the DSO in a Smart Energy System Environment: Key Issues and Policy Recommendations

A CERRE Report

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Executive summary

Technological developments – summarised by the term 'Smart Energy System' – as well as changes on the supply and demand side of the electricity market (such as the growth of distributed generation and the deployment of charging stations for electric vehicles), are fundamentally changing and challenging the role of DSOs. It is crucial that DSOs provide appropriate responses.

The key challenge is to ensure that the DSO is equipped to perform its role as a **neutral market facilitator** and **to enable sufficient flexibility** that is warranted to balance the intermittency of renewable generation at the wholesale market level. Many of the resources (e.g. demand, distributed generation, storage) that can potentially provide flexibility are connected at the distribution level.

DSOs will play an important role in facilitating the activation of these flexibility resources. They will do so not necessarily directly or in a commercial function, as an intermediary or supplier of flexibility. Rather, they will do so in **a system function** through their control of (metering) data and physical installations (communication devices), and through their necessary relations to TSOs, to network users, to aggregators and to the other players involved in supplying flexibility. In other words, the DSO must play a neutral market-facilitating role.

In this report, it is argued that **while fundamental reforms are not warranted, various legal and regulatory adjustments should be considered**. These adjustment should recognise that a **one-size-fits-all approach would generally not be advisable**, as conditions vary across, and sometimes even within, Member States. European and national legal frameworks should therefore give sufficient leeway to regulators and DSOs to fine-tune network tariffs, contracts with system users and other measures to local conditions. **Frameworks should also allow for experimentation with alternative business models, different forms of network regulation and contracts**.

The report makes the following **eight concrete policy recommendations**

Recommendation #1: Securing a new DSO role

European legislation and national legal frameworks should assign to DSOs the task of neutral market facilitation to ensure that flexibility services are available in the market and can be procured for the fulfilment of core DSO tasks in an efficient, affordable and secure way. Any regulatory adjustment should leave sufficient scope for DSOs and new market entrants to develop and test different business models for the transition to a Smart Energy System.

Recommendation #2: Flexibility services

European and national legislation should provide sufficient flexibility for DSOs to conclude voluntary (and where deemed necessary, regulated) flexibility agreements with system users – either directly or through a third party. It should also be considered whether legislation should allow DSOs to make provision for load curtailment, without sanction (financial compensation). This depends on the question of whether or not network users are granted capacity rights. Legislation should ensure DSOs have access to relevant technical data on the location of generation and consumption facilities.

Recommendation #3: Contractual relations

Outright bans on the conclusion of direct contracts between consumers/prosumers should not be considered unless the protection afforded by general consumer protection and data protection proves to be inadequate. Consumers/prosumers should be free to choose whether they wish to contract directly with the DSO or other third parties supplying flexibility services. Prosumers should enjoy the same level of protection as domestic consumers.

Recommendation #4: Core and non-core activities

European legislation could require Member States to distinguish between core and non-core tasks, while leaving it up to Member States to determine the exact scope of the latter category in the light of actual levels of competition in their jurisdictions. National regulatory authorities could be given the power to supervise the conditions under which DSOs participate in non-core activities and to check that DSOs do not discriminate in favour of their own non-core services at the expense of other market players.

Recommendation #5: Adjusting tariff structure

Distribution tariffs should not be regulated at the European level, except for some fundamental principles. On the contrary, regulations should encourage national regulatory authorities to design tariff structures according to local conditions. However, tariff regulation should recognise common challenges, including: the need for innovation and investment in smart grid infrastructure; neutral treatment of different types of costs, such as OPEX and CAPEX expenditures; different use of network by different users; the need for flexibility at the local level; signals for efficient network use; and the need to incentivise synergies offered by DSOs towards other sectors.

Recommendation #6: Capacity handling and congestion management

While it may be useful for European legislation to set out certain basic principles with respect to DSOs' role in congestion management, detailed regulation is not required. National legal obstacles preventing DSO involvement in network reinforcement and congestion management should be removed. If DSOs are given such powers, they should not simultaneously be engaged in providing similar services themselves (e.g. storage), as there would then be more scope for discrimination. Trade-offs are therefore to be considered. As already indicated, this does not necessarily mean imposing a complete ban. There are many options available to ensure transparency, ensuring that if DSOs are involved in commercial services, these are being provided at arm's length and DSOs are not in a position to favour their services above those of rivals.

Recommendation #7: Handling data

Considering the inherent limits of competition law, European and national legal frameworks should provide the basic principles for neutral data management (e.g. non-discrimination, transparency, neutrality). Any regulation concerning data handling should be based on a deep understanding of the use of different types of data, and should foster competition and innovation. It should also be justified by the limited possibilities of competition law to prevent anti-competitive behaviour.

Recommendation #8: DSO-TSO coordination

European and national legal frameworks should make it explicit that DSOs, in order to fulfil their core duties in an efficient and secure way, can be involved in local balancing and local congestion management tasks by using resources connected to their network. Legal frameworks should encourage TSOs and DSOs to foster cooperation and allow for regulatory and/or contractual arrangements that clearly define responsibilities with regard to grid planning and operation, grid management and security and data management. Detailed regulation can be adopted at the national level taking into account the specific needs of DSO-TSO cooperation in each Member State or region. Governance structures should be revised in order to enable DSOs, involved in local balancing and congestion management tasks, to represent evolving roles and responsibilities in European network organisations.

1. Introduction - The Research Framework

1.1 Research Questions

EU energy policy aimed at liberalising, integrating, and decarbonising energy markets, has resulted in dramatic changes for energy systems, especially with regard to the energy distribution network (EDSO 2014 and EvolvDSO, 2014). A shift towards a Smart Energy System is taking place. On the supply side, there is an increase in large scale and local renewable energy production units. These connections are technologically complex due to the intermittent nature of the resources and the bi-directionality of flows. In addition, new commercial players (e.g. aggregators and energy storage service providers) are entering the market (THINK, 2013; ECORYS, 2014; EURELECTRIC, 2016). These new entrants should lead to the creation of competitive flexibility markets allowing consumers to reap the full potential of the benefits of participating in demand response programmes. Different possibilities exist of what a Smart Energy System (SES) may exactly look like. Nevertheless, there is consensus that a Smart Energy System consists of several key characteristics (Frontier Economics 2015, Ecorys 2014). The main components of a Smart Energy System involve:

i. Integration of large scale renewable energy sources;
ii. Incorporation of distributed generation such as wind, solar and micro-CHP;
iii. New ICT layers are added to the distribution grid, enabling the balancing of demand and supply as close as possible to real time;
iv. Introduction of new contracts and techniques such as demand response contracts, storage service contracts and the provision of storage facilities[1].
v. Flexibility services will be key to keeping the energy system in balance and affordable.

The growth of electric vehicles and charging stations will cause extra local loads on the distribution networks, which may create congestion. Congestion management implies avoiding a thermal overload by reducing peak load on the system due to which failure may occur. This is a short-term problem, but one that requires swift action on the side of the DSO. Solutions may be sought in reinforcing the grid and using load flexibility. Consequently, the transition towards a Smart Energy System will need balancing at not only the national or regional level, but also locally in order to match supply and demand (EDSO, 2013). Smart grid technologies and the rollout of smart meters generate accurate user data enabling the DSOs to better predict and match the supply and demand of energy and to detect and deal with local imbalances and congestion. Smart grid technologies, storage technologies and the internet of things enable energy companies and other service companies to develop new energy services for consumers.

[1] Battaglini, A., Komendantova, N., Brtnik, P., Patt, A., 'Perceptions of barriers for expansion of electricity grids in the EU' (2012) 47 *Energy Policy* 254.

This includes energy efficiency services and services that allow consumers to interact with the energy wholesale market and grid conditions (SEDC Position paper 2016).

This profound change of the energy system creates legal, economic and technical challenges for the DSOs (SEDC Position paper 2016). It would be inefficient and too expensive if DSOs were required to enlarge the capacity of the distribution networks to such an extent that they can accommodate the maximum peaks in demand and supply of energy. Efficient balancing of demand and supply by operating smart demand side management programmes and well-designed congestion management programmes can partly substitute network reinforcements. Demand and supply can be balanced in a more efficient way. For instance, this can be done by shifting peak loads and by stimulating consumers to use energy at times when there is an overload of renewable energy and to supply energy when there is a shortage of energy. Smart demand side management, in combination with transparent network reinforcement programmes, enable DSOs to accommodate the new energy flows in an efficient and affordable way. This would reduce the need for DSOs to enlarge the network capacity to the maximum extent, as the available capacity is used in a more efficient way.

The shift towards a Smart Energy System implies that the roles and responsibilities of DSOs evolve and that their relationships vis-à-vis other (new and existing) market parties change. New challenges are raised for the DSOs as the technical specificities of the distribution networks, the legal frameworks, governance frameworks, the tariff regulations and business models are still based on the old market model for the distribution and supply of electricity to the consumers. At the same time, new services, such as storage services, the role out of Electric Vehicle (EV-) infrastructure, the exploitation of EV-charging stations, and demand side programmes are developing. This raises new questions regarding the roles, tasks, rights and obligations of the DSOs vis-à-vis other (new) market parties and the new smart energy services. There is also a question of whether or not DSOs should be allowed to perform certain new competitive non-core services, such as the delivery of flexibility services, themselves, and if so under what conditions. Or, will the DSOs merely act as neutral market facilitators fostering the performance of these new services by other companies in a Smart Energy System? Current legal frameworks do not provide clear answers to these questions yet. They may even hinder the entrance of new market parties to new markets and the development of demand response services. These questions need to be resolved by European and national regulatory frameworks as DSOs, new entrants and consumers/prosumers need transparency and predictability regarding the tasks and roles of all market players in a Smart Energy System. This clarity is needed to stimulate the necessary investments in smart grids by the DSOs and investments in new energy services by other market parties in a Smart Energy System environment. These investments in networks and services are crucial for achieving the transition towards a Smart Energy System.

The aim of this report is to set out the main issues that have to be dealt with by the DSOs in the transition towards a Smart Energy System and why they should be resolved to enable the DSOs to perform their tasks and responsibilities in a Smart Energy System. The report suggests what

can be done to resolve these issues and will make recommendations as to how these changes can be implemented by policy-makers, regulators and the DSOs themselves to ensure the transition towards a Smart Energy System. This report will mainly focus on the legal, investment and tariff regulation issues that have to be resolved by DSOs and does not deal with the technical issues.

1.1.1 Explanation of main research questions

First, the report examines *why* certain issues are central regarding the performance of DSOs in the transition towards Smart Energy Systems, why these issues are new and why they have to be resolved as a consequence of the transition towards Smart Energy Systems. Furthermore, the report explores whether there are legal obstacles or legal gaps that prevent DSOs from dealing with these issues and why this is so. After having explained *why* certain issues are important, the report assesses *what* should be done to deal with these issues. Dealing with these issues should create certainty about new roles and responsibilities, and in turn enable DSOs to play their roles in the energy transition. It would also enable other market parties to enter new flexibility markets and to offer new energy services. The report asks which legal rules should be removed or adapted in order to enable DSOs to perform their tasks and roles in line with the public interests of sustainability, efficiency, affordability and security of supply. For each issue it discusses *how* this can be done. It also addresses whether new European rules need to be adopted or whether it is sufficient to rely on horizontal legislation (e.g. consumer protection law, data protection law, competition law) to resolve the challenges that DSOs face. The report also deals with the question of whether a one-size-fits-all approach would be feasible, or whether more variety is needed to give leeway to the DSO diversity across, and within, the Member States. Finally, the report reflects on how the rules and regulations can take into account the fact that there is still much uncertainty regarding the time frame of the transition towards an SES and at what date the transition will be completed.

1.1.2 Method

The relevant issues will be elaborated on the basis of the stakeholders' comments, a desk research of policy reports and literature, a legal analysis of the relevant European energy directives and a legal analysis of European and national case law. Two cases are selected that provide examples for new market models for new roles in a Smart Energy System. The USEF model aims to enhance flexibility markets by defining new roles of market players in a Smart Energy System and the CREG model focuses on the enhancement of the participation of consumers in demand response programmes. These models provide for new roles for DSOs and other market players. These models are chosen as they are quite elaborate and detailed and provide different approaches (bottom up and top down) for stimulating new roles and services in a Smart Energy System. The models will be examined to see what we can learn regarding the DSO's main challenges. Moreover, the examination aims to determine whether the models

provide suggestions or answers regarding what needs to be done to resolve the issues the DSOs are facing, and if so, how this can be done.

1.2 Definitions

There needs to be a clear understanding of the key definitions and key players in a Smart Energy System. Current European legal and national frameworks do not address new concepts, such as prosumers and flexibility markets, that are related to the transition to a Smart Energy System. This creates legal obstacles and legal gaps in the application of current rules to new energy services and market players. To have a good understanding of which legal gaps and obstacles may prevent DSOs from dealing with new challenges related to the transition to a Smart Energy System, this section gives insights into the main definitions and descriptions of existing and new concepts and players that are used in this report. This report refers, to the extent possible, to EU energy legislation, relevant policy documents of the European Commission and other research reports, for defining the relevant concepts.

1.2.1 Distribution System Operator (DSO)

The current legal definition of a DSO in the electricity sector is provided by the EU Third Energy Package legislation, namely Article 2.6 of the Electricity Directive (2009/72/EC).[2] In this sense, the DSO is characterised 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.'

In practice, under the current legal framework, the DSO is an entity that operates each local distribution area of electricity and is responsible for providing a reliable real time distribution service within it (Kristov & De Martini, 2014). In turn, a local distribution area consists of all distribution facilities, connected decentralised energy resources (hereafter: DER) and system users that are:

i. Located below a single transmission-distribution interface;
ii. Connected only through the transmission grid to the facilities below a different transmission-distribution interface (Kristov & De Martini, 2014).

This technical characterisation will be used as a starting point, since

iii. Legal definitions may differ from framework to framework;

2 Article 2.6 of the Gas Directive (Dir 2009/73/EC) respectively; Although DSOs exist both in the electricity and the gas sector, the focus of this project (the changing role of DSO and their interaction with smart grids) is on electricity. Nevertheless, mention of gas legislation will be made occasionally, as this helps to clarify some of the core values underlying the relationship between the DSO and the System User.

iv. Market structures and infrastructure vary from Member State to Member State (CEER, 2015).

The *DSO's core responsibility* is the operation of the local distribution area, including all activities required to maintain safe, reliable, efficient distribution service to consumers and connected DER, as well as a stable interface with the transmission grid (Kristov & De Martini, 2014, page 3). As will be explained in Chapter 2, activities that evolve as a consequence of the transition towards a Smart Energy System will be called 'non-core' tasks/responsibilities/functions or 'grey areas'. The DSO's core functions have the characteristics of a natural monopoly and pre-date the transition to a Smart Energy System (CEER, 2014). Part of the national regulatory authorities' tasks and powers (e.g. tariff regulation) relate to the regulation of the DSOs' core tasks and responsibilities (art. 37 Directive 2009/72/EC).

The sum of the DSOs' core responsibilities defines the current *role of the DSO*. The evolution of the DSOs' roles will be shaped by the technical, investment, legal and governance challenges specific to the transition to an SES.

1.2.2 Neutral Market facilitator

In many discussions regarding the evolvement of the role of the DSO in a Smart Energy System, it is noted that the DSO is a so called 'neutral market facilitator'. This notion expresses the idea that the DSOs can enable and facilitate the development of local flexibility markets (see 1.2.5.) in a neutral way, for instance by exchanging data on the network use and on congestion areas in the area of their distribution systems (EvolvDSO 2015). Provided that all privacy law, confidentiality and security standards are met, the DSOs are legitimate entities to deliver services to market parties based on network, contractual and metered data in order to ensure a level playing field for all market players on flexibility markets. They can supply flexibility service providers with data regarding the need for the activation of flexibility services; they can validate the activation of flexibility sources connected to their distribution systems; and they can be involved in settling demand and supply (EvolvDSO 2015).

1.2.3 System Users

The current legal definition of a 'system user' in the electricity sector is taken up in Article 2.18 of the Electricity Directive (2009/72/EC). It is described as 'a natural or legal person supplying to, or being supplied by, a transmission or distribution system'. Though the definition of Directive 2009/72/EC does not make this explicit, it implies that system users are all parties that make use of the energy system, which means that they have a physical connection to the energy system. Both suppliers and/or Balance Responsible Parties with a physical connection to the system can be qualified as system users. Energy services providers and aggregators that do not have a physical connection to the energy system, legally speaking are not system users. The concept of system user is important as all system users have a right to non-discriminatory access to the

energy system (Article 32 Directive 2009/72/EC). Moreover, the network costs should be reflected in the network tariffs that are applicable to all system users on the basis of transparent, objective and non-discriminatory terms.

1.2.4 Customers, Consumers and Prosumers

Where this report refers to the concept of consumer, it refers to both household and business consumers, unless it is indicated otherwise. However, as explained below, from a legal perspective the term consumer may have a less broad meaning and may only refer to household consumers in current EU energy and consumer law.

The terms of customer, consumer and prosumers, which are also 'system users', should be distinguished. The former two are defined by EU law, while the latter is not. This creates certain gaps and uncertainties regarding the rights and obligations of these particular systems users, briefly explained below.

In short, the *customer* is the contractual partner of the energy company in question (Micklitz 2012, page 26). A customer in the sense of the Electricity Directive (2009/72/EC) comes in various categories and is taken up in Article 2.7 – 2.12. In general, it concerns a final or wholesale customer of electricity.[3] The final customer does not sell gas or electricity, but uses it him or herself. This notion of final customer can be further divided into household and non-household customers. According to Art 2(7) of the Electricity Directive, a household customer is 'a customer purchasing electricity for his own household consumption, excluding commercial or professional activities.' (Micklitz 2012, page 26). A non-household customer, on the other hand, is a commercial or industrial customer.

Third Energy Package legislation leaves the term *consumer* undefined, but Article 2.1 of the EU Directive on Consumer Rights (2011/83/EU) provides for a legal description of the term. Here, the consumer is – very broadly – described as 'any natural person who is acting for purposes which are outside his trade, business, craft or profession'.

The *prosumer* (the energy consumer who is simultaneously an energy producer) is a concept that is widely used in this report as well as a well-known term in policy circles. We can describe prosumers as 'customers who produce electricity primarily for their own needs, but can also sell the excess electricity.'[4] Prosumers are generally connected to the distribution network with small to medium installed capacity. However, despite the recognition of the concept and its wide use, the term prosumer is not defined legally in the European directives and not always

[3] Article 2.7 of the Electricity Directive. The customer can be further subdivided into categories of the wholesale customer (Art. 2.8), final customer (Art. 2.9), household customer (Art. 2.10), non-household customer (Art. 2.11) and the eligible customer (Art. 2.12).
[4] Eurelectric, 'Prosumers – An Integral Part of the Power System and the Market – A Eurelectric Paper' June 2015, p. 5.

defined in national law.[5] The result of this is that it is unclear to what extent the current legal definitions of customer and consumer (partially) apply to the prosumers as well. The question that arises then is to what extent a prosumer qualifies as a customer or a consumer. In addition, to what extent does the prosumer have the corresponding rights and obligations as set out in the Electricity Directive and the Directive on Consumer Rights?

For instance, it would seem that the prosumer would not fit into the definition of a household customer at present ('a customer purchasing electricity for his own household consumption, excluding commercial or professional activities'). Similarly, it is unclear whether prosumers are considered consumers within the meaning of the Directive on Consumer Rights. The risk is that prosumers may not fall within the remit of the special consumer protection provisions in the energy directives and the general consumer protection directives as far as they act in their (partial) capacity of prosumer.

The issues that stem from these gaps (e.g. to what extent a prosumer is legally – at least partially – a household customer or consumer), should be tackled in future policy making regarding the SES. More clarity on the reach of these terms and their inclusion or exclusion of prosumers, for instance through a broad interpretation of current regulations, is necessary.

1.2.5 Flexibility

Due to the growth of decentralised generation and large-scale renewable energy projects, the supply of energy is increasingly of an intermittent nature. Therefore, as a consequence of the shift to a smart and sustainable energy system, there is a need for more *flexibility* in the distribution grid.

Flexibility can be seen as the modification of generation injection and/or consumption patterns in reaction to an external signal (price signal or activation) in order to provide a service within the power system (EvolvDSO 2014, p. 23 and Eurelectric 2014 b). Therefore, flexibility entails the ability to foresee changes in SES conditions and adapt to them in a swift, secure and cost efficient manner (ECORYS, 2014, page 36).

There are different types of flexibility:

v. Supply-flexibility can be offered by players involved in the production and sale of electricity (e.g. through storage or capacity cuts to avoid overload) or ensured by grid operators (e.g. through feed-in cuts and activation refusals);
vi. Demand-flexibility can be provided by consumers (including prosumers) through active market participation. A key means of participation is *demand side response,* understood here as the changes a consumer is willing to make

[5] Spanish, French and Italian energy law for instance already defined the concept of prosumer and recognise corresponding rights and obligations for prosumers.

to his electricity consumption patterns in reaction to an external incentive signal (typically monetary) (EvolvDSO, 2014, p. 23). In cases where such signals fail, grid operators may be able to ensure demand-flexibility through other forms of *demand management*, such as electricity curtailment.

vii. Grid-flexibility refers to the capacity of the network to adjust to changes in supply and demand without cutting an active feed-in or curtailing supply, and is inextricably linked to the level of investment in network reinforcements and operational capacity.

viii. Flexibility value chain refers to each and every step a flexibility unit goes through, from its source (e.g. by a consumer consuming less energy than originally envisaged by its supplier) to its delivery to the player demanding it (e.g. a consumer consuming more energy than originally envisaged by its supplier). The flexibility chain involves a wide range of players. On the demand side, TSOs and DSOs can use flexibility to manage congestion and, to a certain extent, substitute certain infrastructure investments to make sure that the maintenance and operation of the networks will not become too costly (ECORYS, 2014). Aggregators, energy retailers and suppliers may demand flexibility for portfolio optimisation, while balance responsible parties (BRPs) may need it for imbalance settlement (ECORYS, 2014, page 36).

1.2.6 Aggregators

Aggregators can be seen as intermediaries that aggregate customers' flexibility. They aggregate the capability of energy users (industrial, commercial, residential) to reduce energy and/or shift loads on short notice (SEDC 2016, p. 13). They create a pool of aggregated controllable load, made up of many smaller consumer loads, and sell this as a single resource (SEDC 2016). Suppliers can take up the role of aggregators. The role of aggregator can also be taken up by parties that function independently of the suppliers.

1.3 Legal Principles Underlying the DSO – System User Relationship

1.3.1 Task and Responsibilities of the DSO vis-à-vis the System User

DSOs and other players in the EU energy market are currently regulated by the third energy legislative package consisting of two directives and three regulations (hereafter 'Third Energy Package'). As explained in the previous section, in the EU Internal Energy Market, the DSO is a natural or legal person tasked with operating, maintaining and developing the electricity and gas distribution systems and its interconnectors in a secure, efficient and sustainable way. In this way, the DSO ensures the long-term ability of the system to meet the reasonable demand for energy of its system users. It also became clear that in the transition to SES, the role and responsibilities of the DSO vis-à-vis the system users and the market parties would change.

These changes are accompanied by a range of challenges and legal gaps, and obstacles may prevent the DSOs from dealing with these issues. Before elaborating on the most pressing legal challenges and gaps, the report will first explain what are the underlying EU legal principles that currently regulate the relationship between the DSO and its System Users.

In addition to the 'Third Energy Package', two other types of European directives are of specific relevance for the regulation of the relationship between the DSO and the System Users, namely: 1) the Energy Efficiency Directive, and 2) customer and consumer protection law.

1.3.2 The Electricity Directive

According to the EU common market rules as taken up in the Electricity Directive (2009/72/EC), the following core tasks and responsibilities of the DSO are defined:

1. **Responsibility for operating, ensuring the maintenance of** and **developing** the distribution system in view of **ensuring** the long-term ability of the system to meet reasonable demands for the distribution of electricity (Article 2.6);
2. Distribution of electricity in an **economically secure** and **reliable** manner (Article 25 para 1);
3. **Independence** in legal form, organisation and decision making (Article 25, para 2 and Article 26, para 1);
4. **Non-discrimination** between system users (Article 25, para 2);
5. **Providing sufficient information** to all system users (Article 25, para 3);
6. **Transparency** in procuring the energy in its system according to transparent, non-discriminatory and market based procedures (Article 25, para 5);
7. **Objectivity:** Balancing the system in an objective, transparent and non-discriminatory manner, including rules for the charging of system users of their networks for any energy discrepancy (Article 25, para 6);
8. **Ensuring** that DSOs apply the **rules and tariffs** that have been established in a non-discriminatory and **cost-reflective** and transparent way by the national regulatory authorities (Article 25, para 6 and Article 37, para 6);
9. **Preserving confidentiality** of commercially sensitive information (Article 27);
10. **Member States may require that the DSOs prioritise** generating installations that use renewable energy sources or waste or producing combined heat and power (Article 25, para 4);
11. **Considering** energy efficiency/demand-side management measures (Article 25 para 1 and para 7).

The abovementioned core legal principles regulating the DSO can be reconciled with the public service obligations of **security of supply, sustainability** and **competitiveness** as provided for by **Article 3(1)** of the Electricity Directive. This article prescribes that electricity undertakings should operate in accordance with a view to achieving a competitive, secure and environmentally sustainable market in electricity, and shall not discriminate between those undertakings as

regards either rights or obligations. The DSOs should facilitate the free choice of a supplier by connecting the energy consumer to the system. The DSO should enable the consumer to switch supplier by granting competing suppliers access to the grid on non-discriminatory, transparent and objective terms.

Most of the above-mentioned obligations regulating the DSOs are based on the traditional market model. In this, there is a one-way-flow of energy, produced by large-scale coal or gas fired production plants, and transported by the network operator to a passive energy user. However, some of the provisions make references to the shift towards an SES, though mostly they are not formulated as explicit obligations (see obligations 9 and 10). Member States are encouraged to modernise the distribution networks, such as through the introduction of smart grids, which should be built in a way that encourages decentralised generation and energy efficiency (consideration 27 of the preliminary considerations of Directive 2009/72/EC). Furthermore, Annex I encourages the Member States to implement intelligent metering systems that shall assist the active participation of consumers in the electricity supply market.

1.3.3 The Energy Efficiency Directive

In addition to the Electricity Directive, the 2012 EU Energy Efficiency Directive (2012/27/EU) also provides for relevant rules that regulate the DSO's behaviour regarding the System User. The Energy Efficiency Directive provides for more rules to stimulate the evolvement of the DSOs towards operating in an SES environment. The Energy Efficiency Directive also provides that Member States should ensure that:

1. Consumers have access to accurate billing information, based on actual consumption (Article 10, para 1, Annex VII);
2. Member States shall ensure that consumers have access, in clear and understandable terms in or with their bills, contracts, transactions, and receipts at distribution stations to a minimum amount of information regarding actual prices, and actual and historical consumption (Annex VII);
3. DSOs guarantee the distribution of, and give priority access to, electricity from high-efficiency cogeneration (Article 15, para 5);
4. DSOs ensure non-discriminatory treatment of, and close cooperation with, demand response providers, including aggregators (Article 16, para 8);
5. Energy distributors, distribution system operators and retail energy sales companies do not impede the demand for, and delivery of, energy services or other energy efficiency improvement measures, or hinder the development of markets for such services or measures (Article 18, para 3);
6. Consumers should be informed on energy efficiency measures (Annex VII);
7. Transmission system operators and distribution system operators shall publish rules relating to the bearing and sharing of costs of technical adaptations (Annex XII);

8. Transmission system operators and distribution system operators shall provide any new producer of electricity produced from high-efficiency cogeneration wishing to be connected to the system with the comprehensive and necessary information required (Annex XII);
9. Transmission system operators and distribution system operators shall provide standardised and simplified procedures for the connection of distributed high-efficiency cogeneration producers to facilitate their connection to the grid (Annex XII);
10. Distribution system operators and energy companies shall provide advice on energy efficiency through bills and other feedback to final customers (Annex VII).

The Energy Efficiency Directive not only provides for more explicit obligations for DSOs and energy companies to facilitate the cooperation with demand response providers and to stimulate demand response, it also formulates obligations for the Member States and the national regulatory authorities in this regard. According to Article 15 (4) Energy Efficiency Directive, the Member States shall ensure the removal of incentives in transmission and distribution tariffs that may hamper participation of demand response in balancing markets and ancillary services procurement. Member States shall require that network operators are incentivised to improve efficiency in infrastructure design and operation, and within the Framework of Directive 2009/72/EC, that tariffs allow suppliers to improve consumer participation in system efficiency, including demand response, depending on national circumstances.

1.3.4 Customer and Consumer Protection Law

When a system user is in a contractual relationship with the DSO, he or she can potentially qualify as a customer within the meaning of Article 3.3 of the Electricity Directive. [6] Annex I to the Electricity Directive, moreover, sets outs rules for consumer protection, which apply in addition to the general rules of EU consumer protection as a *lex specialis*. [7]

However, as discussed above in section I.2 on current definitions, it is not clear legally to what extent, and in what cases, a system user in the broad sense (think e.g. of prosumers) can fit into the definition of a customer or a consumer under EU law. To the extent the system user can qualify as a customer or consumer, the DSO has to take into account the following rights of customers and consumers:

[6] Article 3.3 of the Electricity Directive (Dir 2009/72/EC)

[7] These are the EU Consumer Rights Directive 2011/83/EU of 22 November 2011, Directive 97/7/EC of the European Parliament and of the Council of 20 May 1997 on the protection of consumers in respect of distance contracts and Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts. Consumer protection provisions in the energy directives can be seen as a *lex specialis* of general EU consumer law, as acknowledged by the European Court of Justice in ECJ Case 92/11, *RWE Vertrieb v. Verbraucherzentrale Nordrhein-Westfalen eV*, 2012 E.C.R. (Advocate General V. Trstenjak's Conclusion at point 69) and Lavrijssen 2014, page 12.

1) **The right to be supplied** with electricity of a specified quality within their territory at reasonable, easily and clearly comparable, transparent and non-discriminatory prices and subject to the supplier's agreement (Article 3, para 3);
2) **The right to be connected** to their network under terms, conditions and tariffs set in accordance with the procedure laid down in Article 37(6) of the Electricity Directive (Article 3, para 3);
3) **The right to be informed** about consumption data and actual consumption (Annex I); adequate information on the bill and in the contract (Article 3, para 9, Annex I); adequate information on rights such as dispute settlement procedures (Article 3, para 12)

It follows that consumers should have access to clear and understandable information regarding prices, contracts and their actual and historical energy consumption. The European directives leave it up the Members States to decide who eventually is responsible for the provision of the consumption information to the consumers. The party that is made responsible for data management shall provide the consumer with actual and adequate consumption data. Depending on the arrangements in national law, either the supplier or the DSO will be responsible for providing adequate consumption data.

1.3.5 Conclusion

To sum up, it follows from the analysis made above that the legal tasks and duties of the DSO, both on its own and vis-à-vis its system users, can be divided into three broad categories:

1. Responsibilities in its network *functioning by granting non-discriminatory access to network users*;
2. Responsibilities for upholding certain values;
3. The *duty to refrain* from certain behaviour.

First, the DSO has certain responsibilities with respect to its *functioning*: It has to operate the grid, maintain it and develop it where necessary and in an economically secure and reliable manner. It has to provide sufficient information and work in a transparent way. For instance, the DSO has to ensure that it applies rules and tariffs that have been established by the national energy regulators in a non-discriminatory, cost-reflective, and transparent way. The DSO also has to give priority to generating installations that use renewable energy sources or waste or producing combined heat and power. Energy efficiency/demand-side management measures have to be taken into consideration. National systems of tariff regulation may not hamper, but should stimulate the participation of consumers in demand response programmes for delivering flexibility services to the balancing markets.

Second, the DSO is responsible for *guaranteeing certain values*. To start with, the DSO has to respect the public service values and act in a competitive, secure and environmentally sustainable manner. In addition, the DSO has to ensure the long-term availability of the system to meet reasonable demands for the distribution of electricity. It has to be independent in legal form, organisation and decision making from supply and generation activities. Moreover, the DSO needs to balance the system in an objective, transparent and non-discriminatory manner, including rules for the charging of system users of their networks for any energy discrepancy. The DSO has the duty to preserve confidentiality of commercially sensitive information.

Vis-à-vis the system user, the DSO has to make sure it guarantees them with the right to be supplied and connected to the grid.

Finally, the DSO has the *duty to refrain* from certain behaviour, most notably discrimination: the DSO must not discriminate between system users. Despite some references to broadly and loosely formulated obligations to promote demand response, it follows that the current EU framework is still mainly based on the traditional market model (see section 1.3.2.). This explains why many of the new issues, as will be discussed in the next section, that are relevant as a consequence of the energy transition and the transition towards a Smart Energy System are not dealt with or considered by the current European legal framework. For instance, the role of ensuring market flexibility, which is a key concern in an SES, is not mentioned and regulated in the current European legal framework. Furthermore, the EU legal framework does not distinguish between the DSOs' core and non-core activities. The framework currently does not contain outright bans for DSOs to enter into new areas, such as the operation of storage facilities and the delivery of storage services, as long as they comply with legal and management unbundling requirements. Moreover, the EU provisions encouraging an efficient operation of the energy system and the promotion of the participation by consumers in demand response programmes provide significant leeway to the Member States. In practice, this means that there is a great variety in the national regulatory frameworks for the regulation of core and non-core tasks of the DSOs and of the promotion of demand response programmes.

2. The Changing World of the DSO - Key Issues

2.1 Main issues

This chapter identifies and clarifies the main issues the DSOs have to deal with in the transition towards a Smart Energy System. It argues why these issues are crucial in the transition towards a Smart Energy System and why they need to be resolved by the DSOs to perform their tasks and responsibilities in a secure, affordable and sustainable way in this new environment. The chapter analyses whether there are legal obstacles and legal gaps in the current European and national legal and regulatory frameworks to resolve these issues and suggests what should be done to remove them.

2.2 Neutral market facilitators; facilitation of market flexibility

The current European and national legal frameworks are still mainly based on the traditional model of large-scale electricity production units that produce energy at the request of the energy consumers. The latter are basically seen as passive players not participating in demand response programmes (DRPs) and not producing their own energy. However, the market is in transition and DSOs are constantly faced with new challenges that are related to the transition towards a Smart Energy System. DSOs are facing a more complex distribution system today, which moves away from a static and central 'connect and forget' functioning towards a dynamic and distributed 'connect and manage' model (THINK, 2013; ECORYS, 2014; EURELECTRIC, 2016). This complexity will not change the core responsibilities of DSOs (e.g. maintaining grid security) but may hinder their fulfilment (e.g. if unable to manage demand peaks, and DER flows) (EvolvDSO, 2014). Therefore, DSOs are reorganising themselves in terms of business models, re-training of crucial staff, digitalisation of grid operations and other important managerial issues (EURELECTRIC, 2016). The processes, known as 'active network management' are necessary for DSOs to carry out their core tasks and responsibilities in an SES (EvolvDSO, 2014). As will be explained below (sections 2.4. and 2.6.) there is a shift in network management responsibilities from the TSO to the DSO. There is a further shift with the distribution network becoming a platform in the ICT sense for the sharing of different types of data and energy services. There is wide consensus that DSOs are well suited to act as neutral market facilitators. They can play a central role in enabling flexibility services delivered by distributed generation connected to their grids to reach the market, which they can procure themselves for the fulfilment of their system operation tasks (EDSO, 2013; EvolvDSO 2014; CEER, 2015; EURELECTRIC, 2016).

As explained in section 1.3., the evolving DSOs' tasks and responsibilities related to the role of neutral market facilitator, including the role of facilitator of market flexibility, are not addressed by the European legal framework. Neither are they addressed by the legal and regulatory frameworks in force in many countries (CEER, 2015). In particular, energy regulators have yet to

recognise the broadening role of DSOs as neutral market facilitators that facilitate the development of market flexibility to integrate renewable energy sources connected to the DSOs' grids in an optimal way.

Legal frameworks do not yet take into account that new market players, such as aggregators and storage service providers, are entering the market. Aggregators may act as intermediaries in trading the flexibility of consumers and prosumers. Legal regimes or network codes may not always provide aggregators equal access to the flexibility markets for offering flexibility services to the TSOs or DSOs, which hampers the development of flexibility markets and demand response programmes. Neither do legal regimes provide clear indications as to what these aggregators may look like, and whether the role of aggregators can also be fulfilled by other players, such as suppliers or Balance Responsible Parties (BRP). Different alternatives and business models are possible.

Due to these uncertainties, legal discussions arise regarding the exact delineation of the role of the DSOs as neutral market facilitators and their main responsibilities vis-à-vis other market players. As will be discussed in section 2.3, this discussion is complicated by the new grey area regarding the division between the DSOs' core and non-core tasks in a Smart Energy System and whether potentially competitive non-core tasks may or not may be fulfilled by DSOs according to the law. It is important that European and national legal regimes fill the legal gaps and provide clarity regarding these questions. Uncertainties regarding the role and the responsibilities of the DSOs vis-à-vis the other market players should be removed to create secure conditions for an attractive investment climate. This is important for ensuring that DSOs are able to make necessary network investments to facilitate the energy transition and to guarantee that consumers have access to competitive energy services. Certainty about roles and responsibilities is also important for other market players that have to invest in those new smart energy services, such as flexibility services, including demand side response programmes and storage facility services. In order to be able to clarify the DSOs' role as market facilitator, several other challenges need to be addressed. These challenges will now be dealt with in order of priority.

2.3 The delineation between the DSOs core and non-core activities: participation in potentially competitive markets

In the transition towards a Smart Energy System new players enter the market and new services are available that may provide flexibility for integrating renewable energy sources in the energy system. Legal discussions arise as to the extent DSOs may do no more than facilitating the provision of these non-core services, or may rather be allowed to perform these non-core services themselves in order to ensure an adequate performance of their core tasks. The Third package provides for a delineation of the DSOs' core activities, though it is silent about the distinction between the DSOs' core activities and potentially competitive non-core activities. The core activities fall to a large extent under the scope of the exclusive rights that the Member

States have awarded to the DSOs. The assumption is that exclusive rights for these activities can be justified on the basis of the provision of a service of general economic interest by the DSOs, in that the DSOs have the task to guarantee a sustainable, secure and affordable energy supply. Competitive non-core activities are activities that are not inseparably linked to the performance of the DSOs' core tasks and for which competition may be possible. DSOs may benefit from synergies between the development of core and non-core activities, which may help them to create new, innovative energy services. These services may help them to better fulfil their core tasks.

This report distinguishes the following tasks in the future SES (compare: ECORYS, 2014):

i. Flexibility services (storage services, demand response programmes);
ii. Infrastructure provision for electric vehicles;[8]
iii. Infrastructure provision for storage facilities;
iv. Energy efficiency services;
v. Ownership and management of metering equipment (CERRE 2014).[9]
vi. Hosting of other services on the electricity distribution networks;[10]

In theory most of these activities are or can be competitive, and the actual level of competition is different across geographical and product markets. The provision of flexibility services, infrastructure for electric vehicles, infrastructure for storage facilities, and efficiency advice, are potentially competitive activities that interface with and may contribute to an efficient fulfilment of the DSO's core tasks. For example, DSOs may procure and manage flexibility for fulfilling their core tasks such as guaranteeing sufficient network capacity (EDSO, 2013; CEER, 2015) but they do not have to be flexibility service providers themselves (EURELECTRIC, 2016). They need to have some control over electric vehicle charging points (such as information about the points and distance between them) to maintain system balance, but they do not have to provide the charging infrastructure themselves.

The EU and the Member States face several legal challenges when making decisions regarding entrance and the regulation of the DSOs in new (competitive) markets for non-core activities

[8] It should be noted that in some areas (for instance big cities) electric mobility could potentially take off through competition alone, however in some areas no private investor is willing to invest in electric vehicle infrastructure. This hampers the decarbonisation of transport and may warrant Member States to stimulate (temporary) DSO involvement in the infrastructure for electric vehicles by stimulating an optimal level of charging points.

[9] However, de facto metering is a core activity in most Member States, except in the UK. This is due *inter alia* to the close synergies in the operation of the grid and the operation of metering systems.

[10] DSOs, thanks to the synergies and capillarity of their networks, can play an important role for other strategic sectors, such as the telecommunications sector, since they can allow to reduce the cost of new advanced services for the system as a whole. Directive 2014/61/EC introduces the obligation for network operators (e.g. DSOs) to grant access to their network with the purpose of hosting very-high-speed communication infrastructure reducing its cost. Directive 2014/61/EU of the European Parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks Text with EEA relevance**,** *OJ L 155, 23.5.2014, p. 1–14*

that may be related to the performance of the DSOs' core activities. They are faced with the following challenges:

i. Establishing a clear dividing line between core and non-core activities;
ii. The DSOs role and scope of involvement in non-core activities as defined by the regulator;
iii. DSO compliance with potentially stringent unbundling requirements and other regulatory requirements;
iv. Potential role of national regulators in deciding on DSO involvement in non-core activities.

DSOs generally have a low-risk profile due to their core monopoly activity and the fact that costs are normally covered by regulated tariffs. For these reasons, it could be argued that non-monopolistic grey areas in principle should not be entered into by the DSOs. CEER holds the opinion that DSOs should be excluded from them or allowed to perform them under strict regulatory requirements only (CEER 2015). In Sweden, for example, DSOs may own batteries but not operate them under their existing licenses. Similarly, DSOs can own and manage charging stations' assets, but their operation is generally considered a retail activity (Meeus & Hadush, 2016). In the Netherlands, it is proposed that the DSO may be granted a temporary task to develop potentially competitive non-core activities in case these are important for the future development of the smart grid and other market parties cannot yet sufficiently deliver these services to invest in charging points for electric vehicles. This lack of investment in infrastructure is a serious obstacle towards the decarbonisation of transport. DSOs could play a temporary role to accelerate the development of electric mobility by rolling out an optimum level of charging points, making them accessible to third parties (such as energy suppliers) on a non-discriminatory basis.

The challenge here, however, is that DSOs' involvement in potentially competitive markets could pose a threat to the competitive process and harm consumers (CEER, 2015). If the DSO takes on new roles, sufficient controls and structural prerequisites will be required to ensure that it does not use access to commercial data to gain undue competitive advantages or create market distortions (CEER, 2015). There seems to be some consensus around the need to impose a minimum of unbundling requirements on DSOs active in competitive downstream markets, but not in their scope and depth across the Member States. Within the framework of the CEER consultation on the role of the DSO, a number of consultation responses (mainly from DSOs) stated that the current unbundling requirements of the Third Energy Package, and in particular 'debranding', already ensure sufficient independence of DSOs from a vertically integrated undertaking (CEER, 2015). However, in CEER's view, these requirements are a bare minimum standard for unbundling that should be implemented across the EU and complemented where necessary by stricter unbundling rules (under Article 26 paragraphs 1-3 EC 2009/72 and /73) as well as a revision of the *de minimis* threshold.

The lack of a clear legal framework regarding the distinction between the DSOs' core and non-core tasks may be detrimental for ensuring an adequate investment climate in a Smart Energy System and for facilitating the entry of other new market players that need to have confidence there is a level playing field in new markets. Therefore, European and national legal frameworks should fill this legal gap and provide clarity regarding the division between the DSOs core- and non-core tasks. Different alternatives are possible and the most optimal solution may differ depending on each specific situation within and across Member States. The actual involvement of DSOs in non-core activities should be defined at Member State level. Substantial observable differences regarding the regulation of DSOs across and within Member States concern operated voltage levels, the scope of activities, the size and number of DSOs in a country, the level of unbundling and the regulation applied (THINK, 2013; EvolvDSO, 2014). These elements, and particularly the levels of unbundling and competition in each downstream market, may be key to determining whether DSOs' involvement in certain non-core areas is advisable from a competition perspective and the way national legal or regulatory frameworks delineate the distinction between the DSO's core and non-core activities. As actual competition levels and scope of activities are country specific, and lack of competition in non-core activities may be of a transitory nature (such as in the rolling out of electric vehicle infrastructure), DSO involvement in these non-core activities may be temporary. In order to ensure that legal frameworks and regulatory decisions regarding the DSO involvement in non-core activities do not frustrate competition and innovation, national regulators could be granted the power to define the scope and conditions of DSO involvement in non-core competitive activities. National regulators should base their decisions on an assessment of the actual and prospective competitive level in a certain region or Member State.

Moreover, it has to be mentioned that there are other non-core activities that DSOs are nowadays required to carry out as an obligation in order to create synergies and reduce the costs of deploying other services and markets. This includes access to distribution networks for the purpose of hosting very-high-speed telecommunication infrastructure (Directive 2014/61). Such obligation to offer access and host other services should not constitute a burden for DSOs or hamper the secure operation of the electricity network and should be properly promoted by distribution remuneration. For instance, National Regulatory Authorities may decide to share a part of DSOs' benefits of hosting other services' networks with electricity network users, for instance by clawing back a percentage of DSO's margins related to the non-core activity from distribution tariffs. In establishing the amount of such claw back, the avoided cost of networks' duplication should be properly taken into account and the economic incentive for DSOs to share their infrastructure should be maintained.

2.4 DSOs as neutral data managers

DSOs have access to data regarding energy use, imbalances and congestion areas when exercising their core tasks. As a result, they are in a good position to exchange and publish data that is valuable in empowering aggregators and consumers to support the system by providing flexibility services, which can help to integrate generation based on intermittent renewable sources (EvolvDSO, 2014). Data handling involves different elements. DSOs should have access to technical data that is generated by the exercise of the DSOs' core system operation tasks. DSOs need this data to fulfil their core duties of network operation and planning. In their role as neutral market facilitator, DSOs are able to share commercial data regarding energy use and energy efficiency in order to stimulate the development of commercial services. However, in many cases data can be of use for both the DSOs' technical core tasks and for their role as neutral market facilitator. For instance, the capacity of a connection is a technical data element but is also used in commercial contracts. Therefore, it is important to look at the use that is made of data for establishing different types of data. Most regulatory frameworks do not yet make proper distinctions between the different uses of different types of data. The transition towards Smart Energy Systems and the use of smart meters creates new data for commercial purposes, which raises new legal questions regarding the types of data that can be exchanged, by whom and under which conditions. To enable market development, confidentiality and commercial sensitivity questions should be addressed as well. In particular, the extent to which obliged sharing of information by DSOs, or the lack of sharing certain information undermines entry and competition, should be established before data can be transferred between market players. Competition law could provide an answer, but it is limited to general rules: DSOs are prohibited from engaging in discriminatory practices regarding data handling that disadvantages their competitors. Furthermore, it can only be enforced ex post. Hence European and national rules may be needed that provide ex ante legal clarity regarding the use of different types of data, the way the data can be exchanged by the DSO and for what purpose (EURELECTRIC, 2016b). When drafting new rules, policy-makers should consider that rigid regulation could prevent innovation (e.g. dictating what data related services should be available and what they should look like) (EURELECTRIC, 2016b). Therefore, any new European and/or national legal rules should take into account that data related services evolve and that innovation should not be hampered.

Furthermore, innovation could be hindered by the lack of development of privacy, security and confidentiality rules and standards (Cuijpers & Koops, 2012). A risk for the successful implementation of Smart Energy Systems is that the introduction of necessary devices such as smart meters can be significantly delayed if the underlying legislation is flawed (Cuijpers & Koops, 2012) and does not ensure an adequate level of privacy, confidentiality and security.[11] In

[11] Commission Recommendation of 10 October 2014 on the Data Protection Impact Assessment Template for Smart Grid and Smart Metering Systems (2014/724/EU).

line with the General Data Protection Regulation, consumers/prosumers should be informed about their data, how their data can be assessed and used and by whom.[12] The lack of technical standards guaranteeing the interoperability of the privacy standards of smart services and devices could hamper innovation and competition.

2.5 Developing system operations; New DSO-consumer contracts for the development of flexibility services

Flexibility service contracts belong to the new tools DSOs can use to optimise system operations, and to integrate renewable energy flows from distributed generation connected to the DSOs' grids, in a Smart Energy System. National legal frameworks could still contain legal obstacles preventing DSOs from concluding new contracts with the consumers/prosumers in order to make flexibility services available, amongst others via demand response contracts. As explained by the Think report, *Shift Not Drift; Towards Active Demand Response and Beyond*, there are many possible types of demand response contracts. In addition, a distinction between voluntarily offered flexibility services and restrictive (regulated) flexibility services – services that are necessary to prevent congestion – should be made. Regulated flexibility contracts imply required load shifting or load curtailment, enabling the DSOs, under certain conditions, to shift or curtail the load of the consumers. This raises the question of whether or not DSOs should compensate the consumers financially for load curtailment. Here a fundamental issue is whether network users should have a right to capacity. In transmission networks they generally do not (dispatch takes network constraints into account), while in distributions networks they do (and so compensation has to be paid if for some reason capacity is not available). If network users have such rights - and hence system operators have to compensate them for not providing capacity - network operators have an economic incentive to reduce capacity unavailability. If network users do not have such rights - and hence have to bear the burden of not getting access - they have an economic incentive to locate where there is sufficient capacity in the network. The "right" allocation of rights may therefore depend on whether network users or network owners should be incentivised.

In any event, the financial implications and impact of contracts must be well explained to consumers (Commission 2015). Furthermore, as the system users will have a more active role in contributing to the system operation tasks of the DSOs, it may be argued that the system users themselves have the responsibility to exercise their contracts in a responsible and secure way. This means that they should be expected to cooperate with the DSOs to ensure an affordable,

[12] The Data Protection Regulation (entering into force 21 May 2016) replaces the Data Protection Directive in May 2018. Documents available at http://ec.europa.eu/justice/data-protection/reform/files/regulation_oj_en.pdf and http://ec.europa.eu/justice/data-protection/reform/files/directive_oj_en.pdf, respectively (last retrieved on 2016-05-08).

secure and efficient operation of the system. National legal, regulatory and contractual frameworks should be revised and remove all legal obstacles for making the conclusion of regulated and voluntarily flexibility contracts (including DSR contracts) possible, reflecting new type of roles and responsibilities of the consumers.

Furthermore, from a transactions costs perspective it may be justified that a Balancing Responsible Party (essentially, intermediaries such as aggregators, suppliers or larger clients) concludes contracts with the DSO on behalf of the consumers. However, regulators and DSOs may want to leave leeway for different types of contracts and assess which contracts contribute to an optimal fulfilment of the DSOs' system operation tasks. In this regard, CEER (2015) expressed concern about DSOs engaging directly with consumers given their monopoly power and the need to allow retail markets and new business models (including aggregators) to offer services.

A problem arises in that it is not clear whether the European consumer protection directives and the specific consumer protection provisions from the energy directives are also applicable to household prosumers and consumers that trade their flexibility. This may lead to a gap in the legal protection of consumers/prosumers that trade in flexibility or sell their electricity. All these legal and economic matters have to be taken into account in a comprehensive manner when deciding on how to adjust national legal frameworks and contractual arrangements to the new flexibility contracts that DSOs may conclude with consumers. Due to the fact that the issues addressed above are often country-specific, national regulators may be best suited to address these issues and determine which specific solutions are most optimal to ensure adequate contractual agreements between the DSOs and the consumers and/or the aggregators (CEER, 2015).

2.6 Network tariffs

2.6.1 General remarks

DSOs are faced with great investment challenges regarding the financing of infrastructure investments in Smart Energy Systems[13]. New tariff structures are needed to allow the DSOs to recoup investments in smart infrastructures and to allow consumers to respond to real time market conditions on the basis of flexibility contracts. Most business models, national legal frameworks and systems of tariff regulation are based on the old market model. Legal frameworks and regulations should abolish all obstacles to considering the characteristics of investments in Smart Energy Systems in the tariff methodologies that regulate energy tariffs. When designing new tariff structures that are adjusted to a Smart Energy System environment, policy-makers and regulators have to take into account three important points:

[13] The European Commission has estimated that over €1 trillion will need to be invested in the energy sector by 2020, with €200 billion for transmission grids and gas pipelines alone (CEPS 2016).

1. Network tariffs should consider that there will be new uses of the networks (e.g. loading by electric vehicle charging stations) and should allow consumers to actively respond to wholesale market signals, contributing to the overall efficiency of the system (SEDC 2016, p. 15).
2. It should also be ensured there is full cost recovery for the DSOs enabling them to finance their core tasks (SEDC 2016, p. 15).[14]
3. There should be a move to a regulatory framework that unlocks investments in innovation and digitalisation of the network, taking into account their positive externalities at system level and the risks that DSOs bear because of the investments.

The following sections will discuss what types of issues policy-makers and regulators have to decide on when adjusting the tariff regimes to an SES environment.

2.6.2 Incremental risks of smart investments

Innovative investment related to smart grids is to a large extent in services, such as data related services, and technology, such as software for the operation of smart grids, and communication technology. This generally falls under operating expenditure (OPEX) rather than capital expenditure (CAPEX) (CEER, 2015; EURELECTRIC, 2016).[15] This raises two issues: first, in tariff regulation there is often a rate of return on CAPEX but not on OPEX; second, the payback period for innovative investments may be different from that of traditional investments. In fact, innovative investments demonstrate some of the difficulties inherent in treating OPEX and CAPEX asymmetrically (incl. network companies' make-or-buy decisions), suggesting a move of regulation towards a total-expenditure (TOTEX) approach (see below).

Moreover, even when falling in the category of operating expenditure, 'smart' investments are characterised by a different (often shorter) lifespan than traditional 'copper and iron' investments. This does not fit with traditional regulatory payback periods, and can lead to a time lag between the investment costs and its recovery through tariffs. Inefficient investment choices may then result, especially where traditional, but more costly, grid reinforcement is an alternative to smart solutions.

DSOs are already undertaking some innovative and non-conventional investments (e.g. in remote recovery and automated network management) in many countries, with a range of different regulatory approaches, including output-based incentives for quality of their services.

[14] Allocation of costs to products, typically following accountancy techniques (cost drivers etc.), is often part of the practical implementation of tariffs; here we concentrate on the underlying principles for providing the right incentives for network users while at the same time ensuring cost recovery.

[15] CAPEX (Capital Expenditure) is an expense where the benefit continues over a long period, rather than being exhausted in a short period. Such expenditure is of a non-recurring nature and results in acquisition of permanent assets. Its counterpart OPEX (Operating Expenditure), on the other hand, is an ongoing cost for running a product, business, or system.

However, they often perceive a high level of risk associated with smart grid investment (CEER, 2015). As long as tariff schemes are mainly based on the traditional investments models of DSOs and do not take into account the characteristics of financing investments in smart grids, the transition towards an SES may be frustrated. It is therefore necessary to develop regulatory schemes specifically aimed at (i) fostering innovation and investments in smart distribution systems and (ii) supporting the changing role of the DSO (e.g. by defining its new responsibilities) (CEER, 2015; EURELECTRIC, 2016).

Furthermore, it should be considered, as was also pointed out by CEER 2015, that the choice of the best regulatory approach will depend on the characteristics of the DSO (e.g. size and structure of the company, maturity of the distribution business) and of the distribution networks (e.g. level of technology and automation, topology of the network, overhead or underground lines). However, there are common issues. For example, regulatory schemes should take due account of the fact that 'smart' investments have shorter lifespans and increase OPEX costs. Therefore, schemes should reduce the cost recovery period, and in particular, considering a shorter depreciation period (CEER, 2015). They should eliminate OPEX/CAPEX trade-offs in terms of regulatory incentives by avoiding differentiations between CAPEX and OPEX and incentivise companies to be efficient from a total cost basis (EURELECTRIC, 2016). In this regard, the so-called 'TOTEX' approach may be more effective by allowing the DSO to adjust investment strategies to the targets specified by the regulators in terms of cost efficiency and outputs (CEER, 2015). It can help deliver long-term investment and efficient trade- offs between active system management (including flexibility and storage procurement) and physical grid reinforcement (EURELECTRIC, 2016).

2.6.3 Adjusting tariff structures

Most regulatory schemes dealing with the network tariffs do not yet take into account, or stimulate, the participation of consumers in demand response programmes. The design of DRPs is especially difficult in local markets, which present market signalisation problems: incentives operate wholesale while congestion occurs locally. On the supply side, price signals may be effective when there are strong correlations for the distribution of energy resources (e.g. sunny or cloudy, windy or not windy) on a given moment within a wide area. On the demand side, price signals might have a paradoxical effect. For instance, low grid prices based on too much distributed generation could lead to a congestion resulting from the activation of several flexible loads on different network parts without distributed generation. Therefore, congestion problems occur locally and each local situation can be different. Designing tariff schemes to deal with local network conditions is a complex task, and although new "smart" technologies may eventually provide solutions, it may take some time until they are effective. The question then becomes how the system of tariffs can be designed in an optimal way given current constraints, and how tariffs may be combined with other measures, to ensure an efficient use of the network.

Network tariffs relate to charges on system users used to finance the costs of operating and maintaining the network in good working order.[16] They encompass transmission tariffs (paid to the TSO when electricity is delivered via its high-voltage network) and distribution tariffs (paid to the DSO for the use of its network). These tariffs are passed, along with general service charges (i.e. costs required either due to energy industry regulations or as a result of system users requesting a special service), either directly to end users or to energy retailers. In the latter case, retailers add their own costs and present the final retail prices to their consumers.

Traditionally, the task of securing sufficient funds for covering the cost of establishing and operating a distribution network was relatively straightforward: the funds would be raised by a combination of connection charges and charges linked to installed capacity and energy consumption. The exact combination of various tariff elements has differed across jurisdictions – sometimes at the discretion of the DSOs themselves – according to idiosyncratic local concerns and practices. Given the relatively inelastic demand for distribution services, it is unlikely that the format for distribution tariffs – which are only one component of the energy bill - has had much impact on the usage of distribution networks.

The introduction of distributed generation, storage facilities, supply to electric cars and smart technologies are likely to make the demand for distribution network services much more elastic.[17] Furthermore, there is now a real possibility that individual consumers – or groups of such consumers – may decide to disconnect from the network and rely solely on self-generation, even if this may not be the most effective and efficient solution for the system as a whole.

More generally, the composition of network tariffs, and hence the cost of using the network, will to an increasing extent affect network usage. In turn, this will affect the opportunities for DSOs to raise the necessary funds to cover their costs. To better understand this, we should take into account that economically efficient tariffing rests on two fundamental principles:[18]

i. Costs that can be related to a particular network user should be allocated to this user, thereby incentivising the user to take account of these costs when making decisions about network connection and use. For example, the cost of

[16] In some cases, network tariffs have also been used to finance other causes, including renewable generation capacity and stranded costs of traditional capacity adversely affected by market reforms.
[17] These possibilities are associated with specific challenges. For example, storage, which may be seen as a solution to bridge the gap between supply by distributed generation and local demand, does not have a strong business in certain latitudes. This is especially true for residential prosumers but may also hold for pumping power plants. The reason for this particular problem is that the economic viability and profitability depends on the increase of intraday price volatility that is not observable today.
[18] These principles rests on the presumption that decisions about network connection and use is taken individually by network users. In cases when such decisions are taken collectively, by groups of users, it becomes relevant to consider also costs that can be attributed to such groups (an example may be a group of user on a specific radial that might consider disconnecting from the network and relying on local generation).

the line connecting a user to the rest of the distribution network should be allocated to him or her (say in the form of a connection charge).

ii. Costs that cannot be related to a particular network user should be allocated to all users in such a way as to minimise distortions to their use of the network.

Here we concentrate on the latter, and more challenging, principle.

The costs of building and operating a distribution network are to a large extent fixed. They do not depend on the connection or usage of individual system users and so have the characteristic of a public good (a non-excludable and non-rivalrous good). Nevertheless, the tariffs put in place to cover these costs may affect system users' decisions about whether to connect, at what capacity to connect, and how much they want to use the network:

i. Fixed (connection) charges discourage users from connecting to the network (instead relying, perhaps, on self-generation);
ii. Capacity charges discourage users from demanding as much capacity as they would ideally prefer; and
iii. Energy charges discourage use of the network, even in cases when the real cost of doing so is negligible.

The challenge is to find a balance between the losses incurred by various types of tariff elements. That is, tariffs should be designed as a mix of elements that in total involve the least distortions to network usage.

Distortions tend to increase with the tariff level. As a rule, therefore, the tariff base should be broad so that each tariff element can be kept low. An implication of this rule would be that not only energy drawn from the network (i.e. load), but also energy injected into the network (i.e. generation), should be subject to network tariffs. By spreading the burden on both load and generation the level of tariff elements can be kept lower than if the burden falls solely on load.

Moreover, distortions increase with the response of network users; tariff levels should therefore be kept low where user response is high. If, for example, generation tends to be more elastic than load, there is an argument for putting less of the tariff burden on generation than on load.

On the other hand, as referred to above, tariffs may also be used pro-actively to incentivise the efficient location of load and, especially, generation, and also relieve congestion and imbalances. Connection and capacity charges could be differentiated according to the costs imposed on the network – both with respect to investment and operation – of connecting new capacity in different parts of the network, thereby directing system users to locate efficiently. Moreover, energy tariffs that vary with respect to underlying imbalances and congestion will provide signals for efficient network use.

A particular issue arises when generation is co-located with load and only net demand (or net supply) is drawn from (or supplied to) the network. Fixed tariff elements, or elements related to

capacity, fall heavily on such prosumers, at least when compared to their net use of the network. They would benefit from having more of the tariff burden put on energy-related tariff elements. In some cases, prosumers may decide that the cost of network services is too high to justify the connection. This may be an argument for shifting the tariff burden away from fixed charges and capacity charges towards energy charges related to net energy flows. However, if the consumption element is disproportionately high compared with the capacity element, a decrease in consumption may preclude some DSOs from recovering the allowed revenues set by regulators[19] (CEER, 2015). This, in turn, may negatively affect investment and innovation levels.

A shift in the tariff burden quickly raises fairness concerns. For example, in some cases prosumers – either individually, or in various constellations such as producer cooperatives – have argued for lower network tariffs (as they generate and use energy locally). However, such a reduction would mean that the costs of other network users will be higher (because of the need to cover fixed network costs). In other words, people who cannot generate their own energy, or who cannot participate in local generation initiatives, will have to pay higher network tariffs. Such an outcome may be deemed unfair, especially if the ones that are not paying still have the ability to come back if their own generation fails in some way (CEER 2016b).

As shown above, the new use of distribution networks leads to a stronger correlation between (flexible) network tariffs and new network usage, which is not yet accounted for by national regulatory regimes and tariff methods. This development requires that new tariff methodologies are designed that stimulate efficient network use (e.g. the prevention of congestion), but that also consider new questions regarding the fairness of the system of price regulation.

Distribution tariffs should not be regulated at the European level (except for some fundamental principles such as non-discrimination, cost-reflectiveness and transparency), as the exact optimal design of the network tariffs will depend on the local specificities of the DSOs networks, the location of production and load units, and the way different groups of consumers react to the price incentives. Therefore, regulators may be given the power to adjust tariff structures and/or tariffs, and DSOs may be awarded the power to adjust tariffs to these local conditions in order to achieve an optimal financing of the smart energy system infrastructure.

2.7 Congestion management and involvement in capacity planning

For optimal system operation, and capacity management and planning, regulators and DSOs should assess what will be an optimal functioning of the flexibility chain. Capacity reinforcements should be based on objective criteria regarding network use, potential congestion and possibilities for congestion management and local balancing. A particular problem is that the less influence DSOs have on decisions regarding the location of decentralised energy resources, the higher the potential for supply driven congestion. An important question therefore becomes if and how regulators should influence the location of

[19] Allowed revenues amount to 50% or more in most Member States (CEER, 2015).

distributed energy resources (or allow DSOs to do so). Regulators and DSOs may also need to influence the location of storage units that are important for relieving local congestion. In addition, it is important for DSOs that they are better informed of decisions of all system users regarding the use of the network, for instance regarding the connection of EV-charging stations. They need this technical information to make the right simulations and network calculations, which will lead to the detection of constraints and the selection of appropriate measures (SEDC 2016, p. 17).

So far, national regulatory frameworks and codes do not provide adequate rules and principles for these types of questions and obligations for the system users. Neither do national legal frameworks have regard to the distinctions between supply-driven congestion and demand-driven congestion, which may require different types of instruments and powers for the DSOs to perform their tasks in an optimal way. This frustrates the abilities of DSOs to plan network reinforcements on the basis of calculations as to how efficient congestion management and load balancing can relieve the capacity use of the network.

Local congestion management should not be regulated at the European level, except for some basic principles such as transparency and non-discrimination. However, national legal frameworks and regulations have to fill the abovementioned legal gaps by facilitating ex ante congestion management and capacity planning by the DSO and by giving them instruments for doing this in an optimal way. For instance, legal frameworks should allow DSOs to buy flexibility to avoid local congestions. These new rules should leave leeway for regulators and/or DSOs to attune congestion management and network reinforcement programmes to the specifics of the legal and economic situation of each DSO.

2.8 New relationships between DSOs & TSOs

2.8.1 Stronger need for coordination and cooperation between DSOs and TSOs

The regulation of the relations between the DSOs vis-à-vis other market players continues to be based on a traditional one-way flow of energy in which TSOs are responsible for network balancing, which may create legal gaps in regulating and governing evolving roles and new relationships. For example, the Third Energy Package focuses on regulating access to the transmission networks rather than tackling issues surrounding the (active) management of distribution networks. This results in legal gaps regarding the regulation and the governance of the relation between the TSOs and DSOs. The idea is that DSOs may take on balancing and congestion management tasks at the local level and use flexibility services to fulfil their newer functions. This creates a strong interrelation between them and the TSOs. Notably, DSOs' and TSOs' decisions regarding flexibility solutions affect each other's tasks and other market players (Batlle and Rivier, 2012; ECORYS, 2014). To ensure system balance, it is crucial that the TSOs and DSOs agree on clear definitions of hierarchical procedures in the network codes and on grid

management plans adapted to one another and to the market (Batlle and Rivier, 2012, CEER 2015, EDSO 2015, CEER 2016c).

Matters in need of coordination in this sense are:

i. Data management and cybersecurity;

ii. Operational and network planning, including investment decisions,

iii. Balancing and system security, including flexibility procurement.

EDSO (2015) made a comprehensive proposal on enhanced cooperation and CEER (2015) announced the development of further tools based on a whole system approach, i.e. a methodology that considers the entire energy value chain including the development and management of the gas and electricity systems (EURELECTRIC, 2016, CEER 2016c). All efforts are aimed at avoiding inefficiencies and at fostering TSO and DSO innovation in fulfilling their core tasks (CEER, 2015). The European legal framework should provide the general principles for DSO-TSO coordination. More detailed regulation should be adopted at the national level to regulate the specific needs for coordination and cooperation between the DSOs and TSOs in different Member States or regions (CEER 2016c).

2.8.2 Enhanced governance

As roles and relationships change, governance structures need to be evaluated. Decision-making procedures and governance structures need to be revised when they lack correct representation and opportunities to provide input for the DSOs and other new players. For example, the changing relationship between DSOs and TSOs calls for effective communication and cooperation of the organisations representing them, which is not always the case at present (CEER, 2015). Enhanced governance is of particular importance when dealing with technical rules (EDSO, 2014), cross-border issues and network planning (EDSO, 2014; ECORYS, 2014; Refe, Mercados & Indra, 2015), including investment decisions that consider the interests of a wide range of stakeholders (ECORYS, 2014; Refe, Mercados & Indra, 2015). For instance, it has to be considered whether the position of the DSOs should be strengthened in European procedures for the adoption of the network codes, which are now proposed by ENTSO-E (the association of European transmission system operators) and adopted by the European Commission upon the request of the Agency for the Cooperation of Energy Regulators (ACER). It could be argued that DSOs should have an equal position as ENTSO-E in European decision-making procedures, when the European Commission and ACER prepare new legislation, guidelines or codes that affect the legal and economic position of the distribution grids (CEER 2016c). However, new requirements would need to be proportionate and avoid placing high costs that may ultimately be transferred to consumers (CEER, 2015; Refe, Mercados & Indra, 2015; EURELECTRIC, 2016).

2.9 Concluding Remarks

The key challenge for DSOs in a Smart Energy System will be to perform their role as neutral market facilitator by enabling flexibility services delivered by distributed generation connected to their grids to reach the market and which are needed for the performance of their system operation tasks in a secure, affordable and sustainable way. To enhance legal certainty for the DSOs and other market players, this new role of the DSO should by clarified by the European and national legal frameworks. However, as technological and economic developments are not sufficiently certain, legal frameworks should allow enough leeway to experiment with and learn from new rules, business models, contracts, services and practices and to adapt them to ensure a sustainable, secure and affordable energy supply.

Furthermore, several related challenges have to be resolved by the European and national policy makers and regulators to enable the DSOs to perform their new roles and responsibilities in a Smart Energy System in an efficient way:

1. European and legal frameworks should clarify the division between the DSOs' core and potentially competitive non-core activities, leaving leeway for the consideration of the economic and legal characteristics of the specific situation of each DSO;
2. To the extent that competition law cannot adequately deal with competitive distortions in data handling, European and national legal frameworks could provide for proportionate and not too restrictive rules concerning data management to ensure transparent and non-discriminatory data management and to facilitate innovation and the development of new energy services;
3. Whenever they exist, national legal and regulatory obstacles for the conclusion of new voluntarily and regulated contracts for the development of flexibility services should be removed;
4. National tariff schemes and tariff structures should be adjusted to the actual network use, should stimulate efficient network use and should take into account incremental investment risks in a Smart Energy System to enable the DSOs to cover their costs of investing in and operating smart grids;
5. National legal frameworks and regulatory arrangements should allow and facilitate an optimal design of congestion management rules and allow DSO involvement in capacity planning;
6. There should be a legal basis for the enhanced coordination and cooperation between DSOs and TSOs and governance structures should be adjusted to reflect these increased TSO-DSO interactions.

The next part will analyse two examples of possible market models in a Smart Energy System. It will be examined whether these models provide any answers/suggestions regarding the way the abovementioned legal obstacles and gaps can be removed and how these issues can be resolved by European and national policy-makers, regulators and DSOs.

3. Country-Specific Case Studies - The Dutch and Belgian Initiatives

This part of the report will focus on possible models for the role of DSOs and other market players in country-specific case studies. The case studies have an exemplary function and include the Dutch Universal Smart Energy Framework (USEF), and the framework for enhancing demand response proposed by the Belgian federal regulator, CREG. These initiatives are chosen because they provide two different ways to deal with the challenges DSOs are facing. One model concerns new roles for the enhancement of flexibility markets (USEF) and the other model concerns the enhancement of demand response in Smart Energy System (CREG). The USEF model is a bottom up initiative from the industry, while the other one has a top down, regulatory approach (CREG). The models have a different focus, but the integration of flexibility services in the energy system is important in both models. Both models are currently being either designed or tested and their compatibility with the European and national regulatory frameworks have not yet been studied in depth. They are examined to find out whether they provide any answers/suggestions regarding what needs to be done to deal with the challenges that were presented above. It will also be examined whether the case studies can serve as a source of inspiration as to how these challenges can be resolved by policy-makers, regulators and the DSOs.

We will first discuss the set-up of these models separately and address if and how they deal with the challenges presented in chapter 2. Then, we will compare both case studies and subsequently assess them to see how they can help us in resolving what needs to be done and how it can be done to resolve the challenges that are faced by DSOs in an SES.

3.1 Case Study 1 – The Netherlands: The Universal Smart Energy Framework (USEF)

3.1.1 Relevant Background Information to the Dutch Energy Market DSOs and TSOs

In the Netherlands, both the TSOs and the DSOs are subject to ownership unbundling. TSOs for electricity have been unbundled according to Article 2.3 of the Electricity Directive 2009/72/EC. The Dutch TSO TenneT, of which the Dutch State is a 100 per cent shareholder, is responsible for managing and operating the electricity transmission system in the Netherlands.

Some market players in the Netherlands (suppliers, producers, traders and major customers) have the role of the BRP. The role of BRP is regulated by technical codes. This means that they have to submit plans about their expected energy use for the next day. If they fail to comply with the programme, the TSO is responsible for balancing the system by buying or selling

capacity on the market. The TSO, in turn, can pass these additional costs on to the party that caused the initial imbalance.

Although unbundling requirements for DSOs are less stringent on EU level than those for TSOs, in the Netherlands, the Dutch Supreme court has decided that they nevertheless have to fulfil the same stringent ownership unbundling requirements as those for TSOs.[20] Provinces and municipalities are shareholders in the DSOs and the law prescribes that they have to be in public ownership. Both TSOs and DSOs have legal monopolies in the Netherlands and they are not allowed to engage in activities that deviate from their core task.[21]

Oversight and key developments

In a recent decision of May 2016, the Dutch Competition Authority (Autoriteit Consument en Markt, ACM), gave a rather lose interpretation of the prohibition for DSOs to deviate from the exercise of their core tasks to manage and operate the distribution systems.[22]

In this case, the energy company RWE had requested an investigation, as it claimed that the DSO Alliander overstepped its core competencies. The reason for this was that three companies under Alliander's wing were engaged in developing energy efficiency and flexibility management software. RWE claimed that by doing this, Alliander was engaging in activities and services that were exceeding its core tasks, since competition could exist in such services.

The ACM was of the opinion that this was not the case. The reason the ACM gave for this was twofold. First of all, the ACM was of the opinion that such activities did not consist of supply or trade in energy, but merely the improvement of energy efficiency and that these services were related to the fulfilment of its core tasks. Second, the ACM stated that it could not decide on the matter conclusively, as the software of these companies was still under development.[23] For these reasons, it was not clear to what extent these companies would take on the role of the BRP.

[20] See Article 26 of the Electricity Directive 2009/72/EC and Article 26.1 of Directive 2009/73/EC. Dutch unbundling requirements are taken up in the Law Wet Onafhankelijk Netbeheer (the Law on the Independent Network ownership); See also Hoge Raad (Supreme Court of the Netherlands) 26 June 2015, ECLI:NL:HR:2015:1727 (Staat v. Essent) and European Court of justice 22 October 2013, C-105/12 t/m C-107/12, ECLI:EU:C:2013:677, NJ 2014/21.
[21] See for TSO requirements Article 12 of the Electricity Directive 2009/72/EC and for DSO requirements Article 25 of Directive 2009/25/EC. Also see Articles 13 en 25 of Directive 2009/73/EC. See also Article 16 of of the Dutch 1998 Electricity Law (Elektriciteitswet 1998).
[22] ACM (Dutch Competition Authority), Openbaar besluit, May 2006, Reference number: ACM/DE/2016/201932_OV, Case number 15.0772.53.
[23] Ibid, see paras 48 – 80.

3.1.2 USEF Explained

Overview

The Universal Smart Energy Framework (USEF) is a Dutch initiative that was launched in late 2015 and is currently in the pilot and development stage.[24] USEF delivers the market model for the trading and commoditisation of energy flexibility, and the architecture, tools and rules to make it work effectively. The model engages both residential and industrial users. It is a bottom-up initiative from the private sector. The USEF Framework is, at least at present, a non-profit partnership (foundation) comprised of seven organisations, each of which is active in the smart energy industry in some capacity. These are ABB (smart technologies), Alliander (energy network company), NDV GL (safety and sustainability), Essent (electricity and gas company), IBM (technology and consulting), ICT Automation (IT and security) and Stedin (DSO).

The objective of USEF seems to be to provide a publicly available, common standard for an SES on which all smart energy products and services can be built, while at the same time fitting 'on top' of most energy market models.[25] It is important to note that USEF explicitly does not focus on legal regulation of the framework (except for data laws and privacy matters).[26] As it is a bottom up initiative from the private sector, it approaches the SES from the perspective of what is technologically feasible. USEF seems to be based on the belief that there are many different roles for different actors and that the market will optimise choices and dynamics. It is for this reason that USEF explicitly does not treat regulatory and competition issues in its promotional materials. The result is that matters such as the delineation between core and non-core tasks and conflicts of interest are not addressed.

The goal of the USEF model is attaining greater 'flexibility' on the grid, recognising all stakeholders in the process. These are suppliers, BRPs and producers, as well as distribution network operators, DSOs, TSOs, prosumers, aggregators and energy service companies.[27] USEF is of the opinion that 'flexibility' as such is a special product that requires its own trading market altogether (see section 3.1.4.).

USEF aims to introduce more flexibility on the grid by extending demand management in electricity consuming devices to include local generation units through so-called Active Demand and Supply (ADS).[28] One of the challenges in this respect is to ensure that the available flexibility is divided optimally over the grid, at the proper location at each point in time. This proves to be difficult, as different stakeholders may have varying preferences in this respect: e.g. the DSO may prefer a 'flat load' on the system and would logically want to have the necessary capacity available on the grid to offload all of the production fed into its network. The end-consumer, on

[24] See www.usef.info; Also see USEF – the Framework Explained (Report of 2 November 2015).
[25] USEF – the Framework Explained (n 16) 4.
[26] See USEF, The Privacy and Security Guideline (Report of 2 November 2015)
[27] Ibid, 10-12.
[28] Ibid, 8.

the other hand, may not want to take these issues into consideration altogether and use energy as needed.

USEF attempts to introduce more flexibility to the grid while taking into account specific challenges faced by various stakeholders. The tool chosen for this purpose is 'UFLEX', a neutral parameter that allows for the monetisation of flexibility.[29] Stakeholders can thus negotiate among themselves and buy into 'flexibility' while comparing this option to (existing) alternatives. This process can be realised in an open market and can be combined with other ways of introducing more flexibility into the system.

One of these alternative solutions is the modification of tariffs to time dependent local tariffs, in the form of time-of-use, dynamic or real-time pricing. This mechanism is what USEF calls implicit demand response.[30] However, the implementation of such a scheme may bring along substantial difficulties in practice, such as end-users paying a disproportionally large part of the costs, in case the market parties providing the flexibility would use their market power.[31]

An additional and essential tool to realise flexibility on the market is to ensure the interface standardisation of technologies for smart services and devices of all stakeholders active in USEF. The grid has to be ready to accommodate an increasing amount of smaller, active, players, i.e. all those that are connected to the SES.

The framework is currently being applied to smart energy demonstration projects in two places in the Netherlands.[32] Next, USEF is also planning to have a pilot in another EU Member State, to examine whether the framework can indeed be fitted 'on top' of a variety of national and cross-border energy systems.

3.1.3 USEF in theory: roles and dynamics

USEF has worked out a strategy that builds on six pillars to unlock this flexibility on the grid in practice. These are: 1) a central role for the 'Aggregator'; 2) in-home optimisation services for the prosumer; 3) flexibility services for the BRP; 4) flexibility services for the DSO; 5) flexibility services for the TSO, and; 6) a flexibility value chain. We will briefly explain each of these below.

Central Role for the Aggregator

USEF proposes a central role for the so-called 'Aggregator'. Aggregators exist in many European markets, but many of them cater to business consumers rather than to households. While the Aggregator is a central pillar in USEF, the framework does not prescribe a distinct *form* for it. The Aggregator itself should determine whether it targets its activities towards household or business customers. The USEF framework should make both these option possible. USEF does

[29] Ibid, 15.
[30] Ibid, 13.
[31] Ibid, 14.
[32] E.g. in the Hoog Dalem and Heerhugowaard

set out six types of business models that the Aggregator may want to follow. These are set out in the graph below.[33]

The idea is that the role of the Aggregator would function as an entity responsible for acquiring flexibility from prosumers and integrating this into a portfolio. From the collected flexibility, the Aggregator could subsequently create a range of 'flexibility services' that serves different markets and different players. The Aggregator's customers would be the prosumer, the BRP, the DSO and the TSO.

[33] Ibid, 46-47.

Table 1: Aggregator Business Models

Combined Aggregator-Supplier	In this model, the Supplier and Aggregator roles are combined to offer Prosumers a supply contract including flexibility options. The added benefit is reduced complexity, because the supply and flexibility provisions can be aligned from the start. The impact of flexibility activation on the Supplier's sourcing and sales position does not need to be compensated by the Aggregator, because the two roles are combined. The Supplier can be the incumbent Supplier, but the Aggregator can also propose a new Supplier to the Prosumer, or take on the role of Supplier itself.
Combined Aggregator-BRP	When the Aggregator and BRP roles are combined, all portfolio optimizations are generated directly within the portfolio of the combined business. As there is no need for further formal interaction between independent parties, USEF does not need to provide support for this model. The BRP can be the incumbent BRP, but the Aggregator can also propose a new BRP to the Prosumer, or take on the role of BRP itself.
Aggregator as service provider	In this model the Aggregator acts purely as a flexibility provider for one of the other roles. The Aggregator provides the means to access flexibility, but instead of selling this flexibility at its own risk, the Aggregator offers its access to one of the other players in the value chain. This will most likely be a long-term relationship, but it need not be an exclusive one and it might be terminated at some stage. Different degrees of partnership may develop, depending on how willing both parties are to disclose their portfolio and optimization information.
Delegated Aggregator	In this business a third-party Aggregator buys flexibility from Prosumers and sells it at its own risk to potential buyers (the DSO and BRP). This means all interactions with other market players have to be formalized, making this a more complex model. The Aggregator and the BRP seek synergy in optimizing the value of the flexibility. This value is shared between the two parties based on mutually agreed conditions.
Prosumer as Aggregator	Prosumers with sufficient flexibility can adopt the Aggregator role for their own portfolios. In this way, USEF enables Prosumers to directly enter the flexibility markets. Practically speaking, only commercial and industrial Prosumers can opt to take on this role; for residential Prosumers, the burden is too high and the volume too low.
Aggregator based on Flex-BR model	In line with the Flex-BR model, the Aggregator controls the Prosumer's ADS during the flexibility activation period. To cover the balance responsibility during flexibility activation, the Aggregator must contract a BRP (the Flex-BRP). The Aggregator and Flex-BRP are competitors of the Supply-BRP and Supplier active on the customer's main connection . The balance position of the Supply-BRP and the supply profile are only affected during flexibility activation The Supply-BRP and Supplier must be compensated to neutralize the impact on their balance and supply positions. This compensation can be achieved in different ways1: through a regulatory framework2, through a contractual relationship, or through corrections to the Prosumer's metering data.
E-mobility role (CSO or EmSP) as Aggregator	EVs are an apt source of flexibility. In public charging situations, there is a market organization with specific e-mobility roles and business models. Two roles are key in most market organizations: the Charging Station Operator (CSO) and the E-mobility Service Provider (EmSP). The USEF position paper "Electric Mobility"3 describes how to align the e-mobility market structure with the USEF framework so that flexibility can be controlled by USEF's Aggregator role and the rest of the charging process handled within the e-mobility domain.

Source: USEF – The Framework Explained, p. 46-47

In-home optimisation services for the prosumer

The second pillar to unlock flexibility on the grid in practice concerns in-home optimisation for the prosumer. For the framework to work optimally, USEF wants to make sure that the prosumer uses flexibility also optimally in the private sphere. Also in this sphere, it envisions an active role for the Aggregator: To reduce energy costs, the Aggregator should facilitate time-of-use optimisation, implying load-shifting from high-price intervals to low-price intervals. Controlling the maximum load (peak shaving) within a predefined duration will, moreover, save costs as well. Another way to create value is through self-balancing by the prosumer, by calculating the difference between buying, generating and selling electricity. Last but not least, the Aggregator could help by what is called controlled islanding during a potential grid outage, i.e. making sure that this grid is reliable in all circumstances. For all these services to work well, tariff schemes have to be known well in advance.

Flexibility services for the BRP

In USEF, the BRP is responsible for actively balancing supply and demand of Aggregators, producers, suppliers and prosumers for its portfolio. It should be noted that in practice balance responsibility typically follows from regulation. However, USEF does not take into account regulation and thus bases its definition of BRP in a possible (contractual) scenario.

The BRP has a different role from the Aggregator, which is only responsible for collecting the flexibility, and not for balancing it. However, the model does not exclude that the model of aggregator and BRP can be combined, even though these two parties can have conflicting interests in case both parties want to provide flexibility services to the consumers or to the TSOs (see below). However, USEF at present is working integrating an independent Aggregator into the model.[34]

USEF envisions four types of services for the BRP:

i. Day-ahead portfolio optimisation shifts loads from high-price to a low-price time interval;
ii. Intraday portfolio optimisation does the same, but within the timeframe of a day;
iii. Self-balancing within the BRP;
iv. Generation optimisation, meaning optimising the behaviour of production units in their preparation for the next load.

[34] See USEF, 'Aggregator: Harmonising EU Aggregation Models for Effective Demand-Side Response' (Article of July 2016), available through <http://usef.energy/Upload/File/Article%20Harmonising%20EU%20aggregation.pdf>

Flexibility services for the DSO

In the USEF model, the idea is that the Aggregator can offer the DSO six different flexibility services:

i. Congestion Management;
ii. Voltage control;
iii. Grid capacity management;
iv. Controlled Islanding;
v. Redundancy Support;
vi. Power quality support.

Congestion management implies avoiding a thermal overload by reducing peak load on the system due to which failure may occur. This is a short-term problem, but one that requires swift action on the side of the DSO. Solutions may be sought in reinforcing the grid and using load flexibility.

This same load flexibility should also be used to prevent voltage problems that may occur when PV systems generate significant amounts of electricity. This results in 'pushing up' the voltage levels in the grid. In these cases, load flexibility can be used by increasing the load or decreasing generation in order to prevent voltage limits. One advantage is that this mechanism can reduce the need for grid investments.

The DSO's performance can also be increased by actively managing the grid capacity. Load flexibility can be utilised here to optimise operational performance through reducing peak loads, extending component lifetimes and evenly distributing loads (USEF, p. 18).

Controlled islanding, through which grids can be separated into centrally controlled clusters to prevent blackout, can moreover be used to prevent supply interruption if fault occurs in a given grid.

Redundancy support would be a service that would reduce the amount and duration of outages. Examples hereof are the supply of emergency power or providing back up power when there are maintenance activities on the grid.

Lastly, the Aggregator may potentially provide the DSO with a power quality support service. This concerns rapid phenomena, occurring in the sub-minute, millisecond range (e.g. flickers and dips). For power quality support, fast and precise devices are needed. Some equipment used by the prosumer may actually be able to improve the power quality on the grid. The idea is that the Aggregator would provide the equipment to the prosumer and the corresponding service to the DSO. However, USEF itself is of the opinion that the market based approach that it offers would be suited to deal with power quality issues comprehensively. Therefore, power quality support is not included in its scope.

Flexibility services for the TSO

Next to the DSO, the Aggregator should also serve the TSO, however not directly, but through the BRP as an intermediary.[35] The services for the TSO are similar to those of the BRP and the DSO, with adaptations where necessary. Examples hereof are primary, secondary and tertiary control, as well as a national capacity market.[36]

Primary control, also known as frequency containment, is the first line of defence against deviations of frequency (USEF, p. 18). This can for instance be caused by the tripping of a large generation unit. These reserves respond rapidly, within seconds, and ensure that the grid frequency remains at a certain level (50 Hz in Europe). The equipment that the prosumer has can provide this service. Currently, primary control is being auctioned by the TSO in the Netherlands and Germany on a weekly basis (USEF, p. 18).

Secondary control, or so-called frequency restoration reserves, is subsequently used to relieve primary control from its duty, so that it can return to a normal operational state. This type of control settles imbalance within one imbalance period. Depending on national regulations, it may be possible to bid into these loads.

Tertiary controls are similar to secondary controls, but respond in a slower manner and can operate for a longer amount of time.

National capacity markets are generally designed to guarantee the security of supply through providing for sufficient peak and non-peak capacity. For instance, an increase in wind and solar energy needs greater supporting capacity to compensate for fluctuations. Load shifting or shedding is also a possibility. Depending on the national regulation in question, load flexibility can be aggregated and supplied to these capacity markets.

The services mentioned here would come together in an interactive flexibility value chain (see figure 1 below).

USEF in practice – Two pilot projects

As mentioned in the introductory paragraph above, two USEF demonstration projects are being carried out in the Netherlands, one in the Hoogdalem neighbourhood and one in Heerhugowaard.[37] While the USEF website mentions these demonstration projects, it provides no detailed information on how the pilots function in practice on its own website.

[35] It is unclear why USEF is of the opinion that this would be the optimal solution, i.e. that an Aggregator should not participate directly on a TSO-operated balancing market. USEF says that "The USEF position paper 'The Independent Aggregator' describes the rationale for positioning the BRP between the Aggregator and the TSO. (version 1.1, 29 June 2015, Hans de Heer, The USEF Foundation.)". We are trying to retrieve this paper for USEF to learn more about its rationale.
[36] Ibid, 18.
[37] See http://www.hoogdalem.nl and https://www.energiekoplopers.nl (In Dutch – accessed 17 May 2016).

On another website, some information is given on the Hoogdalem project: storage systems have been placed in 32 residential houses there.[38] In part, these consist of batteries, and in part of solar cells. Aside from that, smart equipment has been installed in these houses to measure data in view of peak-shaving. In addition, USEF has developed standard software for smart grids and smart homes, which is used to manage demand and response. It should be mentioned that the Hoogdalem area is currently under development: the plan is to realise 1400 residential houses and a shopping mall. In the summer of 2014, 200 of these houses were built. More detailed information on the progress of the project does not seem to be available.

The 'Energiekoplopers' website gives more information about the USEF pilot project in Heerhugowaard (see note 30). Here, smart equipment has been installed into 169 participating residential houses. This equipment is paired with USEF software and automatically balances out the supply and demand by switching electronic devices on and off when needed. Other equipment that is being used includes heat pumps, solar switches, electric boilers and fuel cells. The pilot runs for a year and started in August 2015.[39] Some (very) general intermediate results were made available in October of 2015. Conclusions were, amongst others, that:

i. The software and equipment for switching devices on and off works well, which contributes to the ability to precisely estimate the electricity use in the area. This is crucial since it enables coordinating demand and supply;
ii. An interesting intermediary result is that the heat pump is being used the most for providing the necessary flexibility, and the solar switch the least;
iii. The fuel cell and the solar panels are switched off during the day, when the sun is at its highest. It is during this time that the electric boiler is switched on. During the night and when there is less sun, the heat pump is usually switched off.

After then end of the pilot in the summer of 2016, a final report with results on the Heerhugowaard project will follow. However, the projects are ongoing and more experience has to be gathered to determine what works well, what are the issues and possible solutions, and which adjustments to the framework are necessary.

3.2 Testing USEF's Findings Against Today's DSO Challenges

Now that we have outlined the main characteristics of the USEF model, the question is what roles USEF envisions for the DSOs and how the model deals with the challenges that DSOs are facing today (as discussed in chapter 2 this report).

[38] See http://www.heijmans.nl/nl/nieuws/smart-energy-proeftuin-hoog-dalem-van-start/ (In Dutch – accessed 17 May 2016).
[39] https://www.energiekoplopers.nl/planning-voorbeeld-2/ (In Dutch – accessed 17 May 2016).

3.2.1 The role of the DSO in facilitating market flexibility

As described above, the DSO is part of the USEF flexibility value chain and its key concern is to integrate flexibility in the system operations. The DSO is responsible for the cost-effective distribution of energy, while at the same time maintaining grid capacity and security in a given region. From USEF's standpoint, the Aggregator can offer the DSO several services to manage this effectively. Thus, the Aggregator and the DSO conclude a 'flexibility services contract' about the provision of these services. The reasoning behind this is that the DSO is a regulated entity and therefore can procure USEF's 'UFLEX' for these services under uniform market conditions, reflecting the network codes. However, the USEF model does not require that the Aggregators make contractual arrangements with the DSO. The reason for this is that the operating conditions for selling and procuring flexibility are covered by the market-based coordination mechanism. Different business models for the aggregators are presented.

USEF was designed with active network management in mind, as is clear from the Flexibility value chain and the role of the Aggregator. USEF proposes that the DSO could supersede its traditional passive role to actively and cost effectively manage the distribution network. For this purpose, DSOs (as well as other grid operators) should:

i. Use the flexibility provided by different market players;
ii. Actively manage the available capacity;
iii. Provide the necessary services for SES functioning.

Apart from suggesting that the current role of the DSO could be expanded, USEF does not discuss in detail how the DSO should adapt in this respect. The USEF model also distinguishes the role of aggregators, BRP and consumer vis-à-vis the DSOs, but is not concerned with the legal definition of these roles. It explains this by the fact that USEF if about redefining roles, but not about the market and its regulation.

3.2.2 Data handling

As USEF is a role-based model, there is no clear-cut data manager in USEF. However, all data that is managed in the USEF system is subject to its data policy, set out in their Privacy and Security Guideline. Privacy-wise, USEF is designed to comply with the newly adopted European General Data Protection Regulation.[40] All data concerning energy consumption will be treated as personal data, subject to a Data Protection Impact Assessment. This means that data streams based on necessity, i.e. public interest or a legal obligation will be separated from those that are based on consent from the consumer/prosumer. Therefore, USEF seems to deal adequately with the concern that confidentially of the available customer data may be jeopardised

[40] Ibid, 50; See the text of the Data Protection Regulation http://ec.europa.eu/justice/data-protection/reform/files/regulation_oj_en.pdf (entering into force 21 May 2016).

3.2.3 DSOs' participation in competitive non-core activities

Of all the possible non-core tasks of the SES,[41] USEF focuses mainly on the procurement of flexibility services by the DSOs. USEF promotes the introduction of a market in flexibility in the framework of a so-called Market-based Coordination Design (MCM) and leaves leeway for different business models. The idea is to conclude:

i. Flexibility purchase contracts between Aggregators and prosumers;
ii. A framework contract between the supplier and the Aggregator;
iii. Flexibility service contracts between the Aggregator and the BRP;
iv. DSO connection contracts that have to reflect the possibility to shed the load.

However, the USEF model does not require that Aggregators make contractual arrangements with the DSOs separately, since the operation conditions of procuring flexibility are covered by the MCM as a whole. However, the USEF model would prefer that the DSO set up flexibility service contracts with the Aggregator, if possible for the longer term.[42] The reason to prefer long-term contracts is that the DSO may procure flexibility well in advance, in order to secure a certain supply of flexibility. In USEF, DSOs that intend to sign long-term contracts with Aggregators are advised to set up a tendering process in advance for use when the DSO declares a Congestion Point.

3.2.4 System operations: DSO-consumer contracts

In the USEF model, it is recognised that the conclusion of new contracts between DSOs and system users should be made possible, enabling the DSO to acquire flexibility services for its system operations.

USEF suggests three forms of contracts for the provision of flexibility:

i. Long-term flexibility contract between the DSO and the Aggregator, through which the DSO can procure flexibility long in advance;
ii. Long-term flexibility contract between the Aggregator and the BRP, similar to that with the DSO;
iii. Contracts between energy service companies and prosumers.

The latter can take on a broad variety of forms, depending on the service provided.[43]

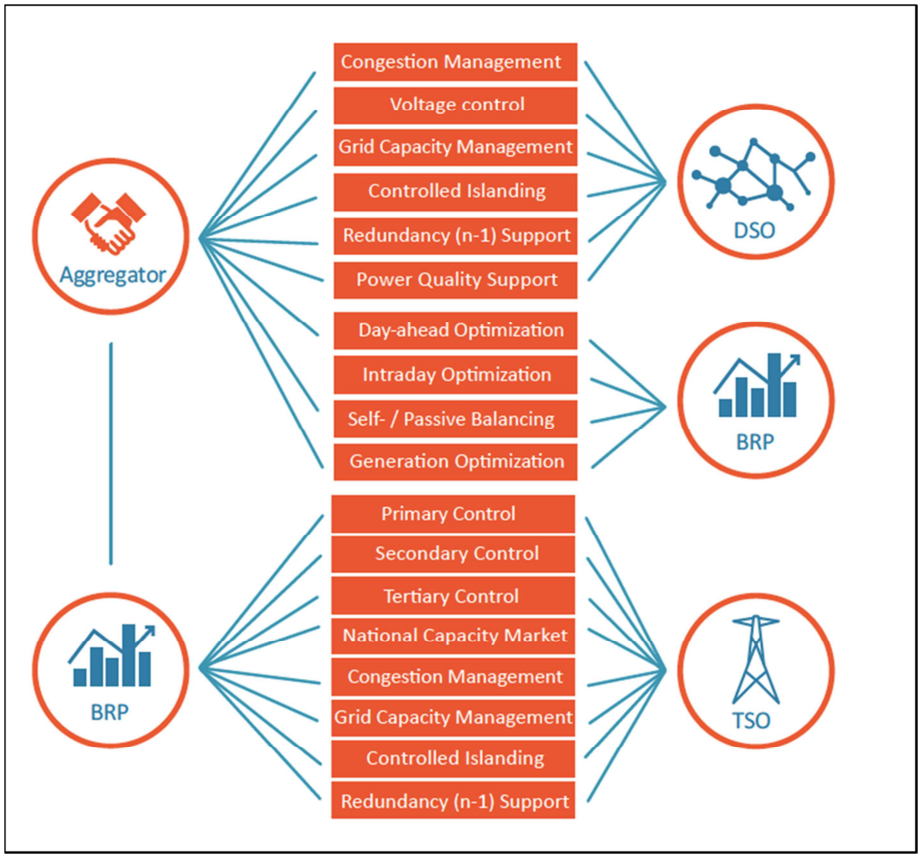
3.2.5 DSO-TSO Relationship and Enhanced governance

USEF sees a changing role for all participants in the Flexibility Value Chain (see figure below). In this sense, it also foresees more interaction and coordination between the DSO and the TSO.

[41] See supra section 2.2.1
[42] Ibid, p 27.
[43] Ibid, p. 27.

However, USEF does not go into detail about this relationship. Rather, it does so in the framework of the Aggregator and its role vis-à-vis the DSO and TSO. USEF does not address governance issues in depth. It merely states that the market needs an effective regulatory and governance framework that reduces the need for interventions such as capacity mechanisms.[44]

Figure 1: the USEF Flexibility Value chain



Source: USEF – The Framework Explained, p. 19

3.2.6 Adjusting tariff structures

The main tool proposed by USEF to deal with incremental risks of investments, is the monetisation of flexibility for the development of flexibility markets. However, in case the proposed flexibility markets fail, USEF proposes that DSOs mitigate the price risk through long-term contracts. In this model, it is key that DSOs make flexibility reliable and financially attractive. For this purpose, long-term agreements on the supply of flexibility for the DSO are crucial. The framework calls this 'Long Term Flex'.[45] The need to ensure demand for flexibility through long-term contracts also applies to the Aggregator, who will have to invest in facilitating the prosumer's flexibility. It remains uncertain how these contracts would be implemented,

[44] Ibid, p. 9.
[45] Ibid, p. 38.

though it is clear that adjustments to the legal framework are Member State-specific. In particular, adjustments to the legal framework may be necessary in order to allow aggregators to have access to flexibility markets.

In order to ensure flexibility, USEF proposes the development of 'implicit demand response'. This implies network tariffs that are time dependent and local, such as time-of-use, dynamic or real-time pricing can be used for local grid optimisation.[46]

3.2.7 Congestion management and involvement in capacity planning

As explained above, USEF envisages the Aggregator as the entity that can help the DSO with managing congestion on the grid. In the framework, solutions may be sought in reinforcing the grid and using load flexibility. USEF prefers ex ante congestion management and proposes the following strategy: The DSO will identify and publish the locations on the grid where overload may occur, basing itself on the data and technology available through USEF. There are the so-called 'Congestion Points'. Based on this information, the DSO can and should identify well in advance when an overload situation may occur. Subsequently, it should inform the relevant Aggregators of this. The Aggregators, in turn, can approach their customers to provide the necessary flexibility. To this end, a Common Reference, which is operated by the Common reference operator, is set up for the exchange of information about connections and congestions.[47]

As regards ex post solutions, USEF allows the DSO to make autonomous decisions to lower loads and generation by limiting connections when market-based coordination cannot solve a congestion problem. However, alternative scenarios are also possible: For example, business models where roles are assigned to separate legal entities are also included in the framework (see table 1 above). The reason USEF is not set on a specific set of rules is because the framework only provides for models for roles and does not engage with regulation, which falls outside of the scope of USEF.[48]

3.3 Case Study 2 – Belgium: Framework Proposed by the Commission for Regulation of Electricity and Gas (CREG)

3.3.1 Relevant Background Information on the Belgian Energy Market

DSOs and TSOs

Belgian TSOs are subject to ownership unbundling with respect to generators and suppliers of electricity in accordance with the Third Energy Package and the Belgian law of 8 January 2012

[46] Ibid, p. 13.
[47] Ibid, p. 24.
[48] Ibid, 21.

that aims to transpose it.[49] With regards to DSOs, the law mandates legal and functional unbundling for both the gas and electricity sectors and contains no special provisions with regard to the unbundling of DSOs serving less than 100000 connected customers.[50] Financing and legal requirements may vary between regions (e.g. in the Walloon Region specific rules regarding financial resources are imposed).[51] In two of the three Regions (i.e. Flemish and Brussels Capital Regions), the DSOs underwent ownership unbundling even though it was not mandatory.[52]

Oversight

The Belgian federal government and the Flemish, Walloon and Brussels Capital Regions set Belgian energy policy in accordance with EU law.

Competences of the federal policymakers include supervising the generation of electricity from conventional and nuclear sources, as well as supply and transmission of electricity via the high-voltage grid (above 70 kv).[53] They also set maximum electricity and natural gas prices for end-customers and network tariffs.[54] The Regions' are responsible for generation of electricity from RES and cogeneration, local transmission and distribution of electricity at lower voltages (below or equal to 70 kv).[55] Additionally, they are competent over energy efficiency, environmental and social issues.[56]

The Commission for Regulation of Electricity and Gas (CREG) is the federal regulator of the Belgian electricity and natural gas markets. In addition to its advisory role to the federal government, CREG[57] is notably in charge of:

i. Controlling transparency and competition in electricity and natural gas markets;
ii. Ensuring that such markets function in accordance with general interests and energy policy goals;
iii. Protecting essential consumer interests.

[49] Cf. CREG press release from17 January 2013: "CREG certifies Elia System Operator as electricity transmission system operator".
[50] CEER, 2016, "Status Review on the Implementation of Distribution System Operators' Unbundling Provisions of the 3rd Energy Package".
[51] CEER, 2016, "Status Review on the Implementation of Distribution System Operators' Unbundling Provisions of the 3rd Energy Package".
[52] CEER, 2016, "Status Review on the Implementation of Distribution System Operators' Unbundling Provisions of the 3rd Energy Package".
[53] Synergrid, [YEAR]: "Energy Grids Serving Society".
http://www.synergrid.be/download.cfm?fileId=synergrid_EN.pdf&language_code=NED
[54] Synergrid,: "Energy Grids Serving Society".
[55] Synergrid,: "Energy Grids Serving Society".
[56] Synergrid,: "Energy Grids Serving Society".
[57] Information available at http://www.creg.be/fr/index.html, last retrieved on 2016-05-06.

For this purpose, CREG supervises and monitors application of relevant laws and regulations and approves network tariffs.[58] At the regional level, each region has entrusted a regulator[59] with advisory tasks and regulation of correct market functioning, DSOs and distribution, public service obligations and green energy.[60]

Key Developments

The Belgian energy market is facing several challenges. In particular, the gas fired power plants face profitability issues, the nuclear baseload is disappearing[61] and an increasing amount of renewable sources needs to be integrated.[62] The switch from gas and nuclear powered plants towards renewables and the transfer of certain tasks (as local balancing) from TSOs to DSOs may increase the influence of regional regulators and policy makers over electricity markets.

Despite these developments, the Belgian federal government assigned CREG the task to identify measures to facilitate access to demand response markets. CREG consulted market participants to identify obstacles and gathered its conclusions in an Intermediate Report on "the measures that have to be implemented to facilitate the access to the demand side response in Belgium" published last 22 January 2016. On 5 May 2016, a definitive report was published on this matter.[63] These two reports will be the object of this case study.[64] Within this context, it should be kept in mind that not CREG but the regional regulators are competent for the regulation of DSOs and energy from RES.

3.3.2 CREG's Model Explained

Overview

CREG's hypothesis is that "In a system faced with a strong rise in intermittent generation, more demand side response would help smooth price peaks and contribute to the safe operation of the network as well as the security of supply of the system."[65]

[58] Synergrid,: "Energy Grids Serving Society".
[59] BRUGEL (BRUxelles Gaz ELectricité) in the Bruxelles Capital Region; CWaPE (Commission Wallonne Pour l'Energie) in the Walloon Region and VREG (Vlaamse Reguleringsinstantie voor de Elektriciteits- en Gasmarkt) in the Flemish Region.
[60] Synergrid,: "Energy Grids Serving Society".
[61] Nuclear power is to be phased out in accordance with Belgian law (Cf. Loi sur la sortie progressive de l'énergie nucléaire à des fins de production industrielle d' électricité, Moniteur Belge, 2003-01-31.)
[62] De Geyter Adriaan – Sia Partners, 2013: "The Belgian Electricity market: overview, analysis of today's issues and suggestions to fix it".
[63] CREG, 2016: ETUDE (F)160503-CDC-1459 sur "les moyens à mettre en œuvre pour faciliter la participation de la flexibilité de la demande aux marchés de l'électricité en Belgique", Rapport Finale.
[64] Only the executive summary of the report is available in English. The rest of the document (pages 5-192) can be read in French or Dutch. The authors used the French version.
[65] CREG, 2016, ETUDE (F)160503-CDC-1459 sur "les moyens à mettre en œuvre pour faciliter la participation de la flexibilité de la demande aux marchés de l'électricité en Belgique", Rapport Intermédiare, page 2.

To encourage participation of demand in electricity markets, CREG took a three-step and interactive approach.[66] In a first step, CREG consulted market participants what obstacles they face.[67] In a second step, CREG proposed solutions to remove the obstacles identified in its intermediate report.[68] Thirdly, after a workshop in 2016 on the intermediate report, CREG drafted a final report in May 2016, discussing the results, recommendations and way forward. This report also included a draft amendment to the existing Belgian Electricity Law to reflect its recommendations. For the reader's convenience, a translation from Dutch to English of this draft law is given in Annex nr. 2.[69]

As a caveat, it should be noted that CREG based itself on the latest Network Code Balancing available at the time when the CREG reports were drafted. The model may have to be adjusted to be up to date with the newest version, which was not yet available when CREG's final report was drafted.

CREG proses the following action plan:[70]

- Adjusting legislation;
- Enacting the necessary decrees;
- Phased implementation of proposed balancing products (see below "Developing products for electricity commodity market).

3.3.3 General obstacles identified in the public consultation

Main obstacles [71]

Market players who responded to the public consultation highlight these two core issues: Lack of a framework that allows end-customers to perform energy transfers and difficulty to access certain products and (electricity) markets. An energy transfer is a transaction that enables the valorisation of demand flexibility (as defined below in the "Definitions" section).

Stakeholders highlighted these problems from a wide range of difficulties of different nature, which will be presented below.[72] It should be noted that each of the so-called 'main obstacles' entails several more specific problems (e.g. a model that encourages energy transfers must tackle regulatory, economical, behavioural and technical issues).

[66] Ibid, page 2.
[67] Ibid, page 2.
[68] Ibid, page 2.
[69] See bijlage 1, 'Wetontwerp' in: CREG, Studie (F)160503-CDC-1459 Definitief Rapport over "de middelen die moeten worden toegepast om de deelname aan de flexibiliteit van de vraag op de elektriciteitsmarkten in België te faciliteren", 5 mei 2016.
[70] CREG, Final Report, p. 85.
[71] Ibid, page 2.
[72] Ibid, page 13-15.

Regulatory obstacles [73]

As stated above, currently there is no regulatory framework defining the roles, responsibilities and relationships between market parties. Confidentiality issues further complicate the regulation of energy transfers as defined below in the "Definitions" section.

Smaller consumers connected to the distribution experience additional difficulties. They cannot adequately access commodity markets, and may be hindered by contractual limitations to flexibility trading and by high administrative burdens. Additionally, rules regulating energy flows do not yet allow the use of flexibility in lower voltage networks to be used by Balancing Responsible Parties (BRPs).

Economic and commercial obstacles [74]

Overall, the business case for the sale of flexibility by residential customers is not sufficiently positive in cases where the consumption element of prices is relatively low. Investment costs are relatively high compared to the rather uncertain market fluctuations and revenues. In particular, costs of sub-metering solutions proposed by DSOs and TSOs are considered high and independent expertise and offers are scarce. Moreover, end-consumers that surpass the capacity they contracted can be penalised and exposed to higher network tariffs in certain scenarios. Those willing to sell their flexibility despite these issues may still be blocked from entering the market by long-term contracts and contracts containing tacit renewal clauses that bind them to aggregators.

Behavioural obstacles[75]

Consumers seem to lack interest, knowledge and expertise to participate in flexibility markets. They often prefer a fixed remuneration and a low number of transactions.

Technical obstacles[76]

Consumers can only be aware of their available flexibility and exposed to price signals if quarterly hour consumption measurements are carried out. According to CREG, this is not the case for most DSOs' clients in Belgium. Additionally, adequate interoperability standards for technical equipment (such as sub-meters) still need to be developed.

3.3.4 Removing the first main obstacle – A model for the transfer of energy

Definitions

CREG wishes to contribute to the design of different markets (i.e. markets for electricity,

[73] Ibid, page 13.
[74] Ibid, page 14.
[75] Ibid, page 15.
[76] Ibid, page 15.

auxiliary services and strategic reserves) and enhance demand participation.[77] For this purpose, it developed a framework aimed at enabling the commercialisation of demand management.[78] The framework entails the definition of certain roles, rights and responsibilities and the enabling of energy and information transfers.[79] These are some of the key definitions (that correspond to the definitions we used in section 1):[80]

i. Supplier is a natural or legal person who sells electricity (produced or bought by him) to a customer or end-supplier;
ii. End-customer is a natural or legal person that buys energy for its own consumption;
iii. Vendor-customer is the end-customer that valorises (i.e. sells) its flexibility;
iv. Flexibility is the ability of end-customers to modify their consumption profiles according to external signals sent by electricity market players;
v. Flexibility Service Provider (FSP) is the provider of flexibility and, more specifically, demand-side flexibility;
vi. Flexibility Requestor Party (FRP) is a buyer of flexibility who may, in turn, resell it;
vii. BRP is an entity responsible for correcting electricity imbalances within a given perimeter (i.e. portfolio);
viii. Aggregator is a service provider that combines multiple consumer loads of short duration and sells or offers them at auction market energy;[81]
ix. Flexibility Data Manager (FDMs) is the manager of data related to flexibility volumes and the identity of the parties involved in the flexibility of transactions;
x. Energy transfer is an activation of demand-side flexibility that impacts two different BRPs and/or suppliers.[82]

Principles

CREG believes that this model can be implemented by applying a new regulatory framework to existing markets (without creating new ones).[83] The new framework should be based on ten key principles:[84]

i. Every end-user has a right to valorise their flexibility without resistance of the BRP of the supplier;

[77] Ibid, page 8.
[78] Ibid, page 8.
[79] Ibid, page 8.
[80] Ibid, page 9-10.
[81] Ibid, page 9.
[82] Ibid, page 11.
[83] Ibid, page 2.
[84] Ibid, page 2 and 22-34.

ii. Every end-user has the right to choose their FSP regardless their energy supplier;
iii. The FSP is responsible for the balancing of the activation of flexibility with regards to the demand he manages;
iv. The intervention of a FSP must not be to the disadvantage of the other parties, which entails the necessity to correct the original BRP's perimeter and compensate the original end-user (see examples 1 and 2 below);
v. The equilibrium must be corrected centrally by a neutral party with the required authorisation (e.g. the BRP);
vi. If the financial compensation does not occur automatically, preference should be given to commercial negotiations. If this does not lead to a result, then there must be a standard solution to compensate so that all demand response offers are taken into account;
vii. From the view of the market, compensation in case of denied activation is desirable;
viii. The end-user owns its meter-data and can use these freely;
ix. The confidentiality of the data should be guaranteed;
x. Every end-user should receive a single invoice for their use of electricity.

The application of these principles to DSOs and other players will be analysed below.

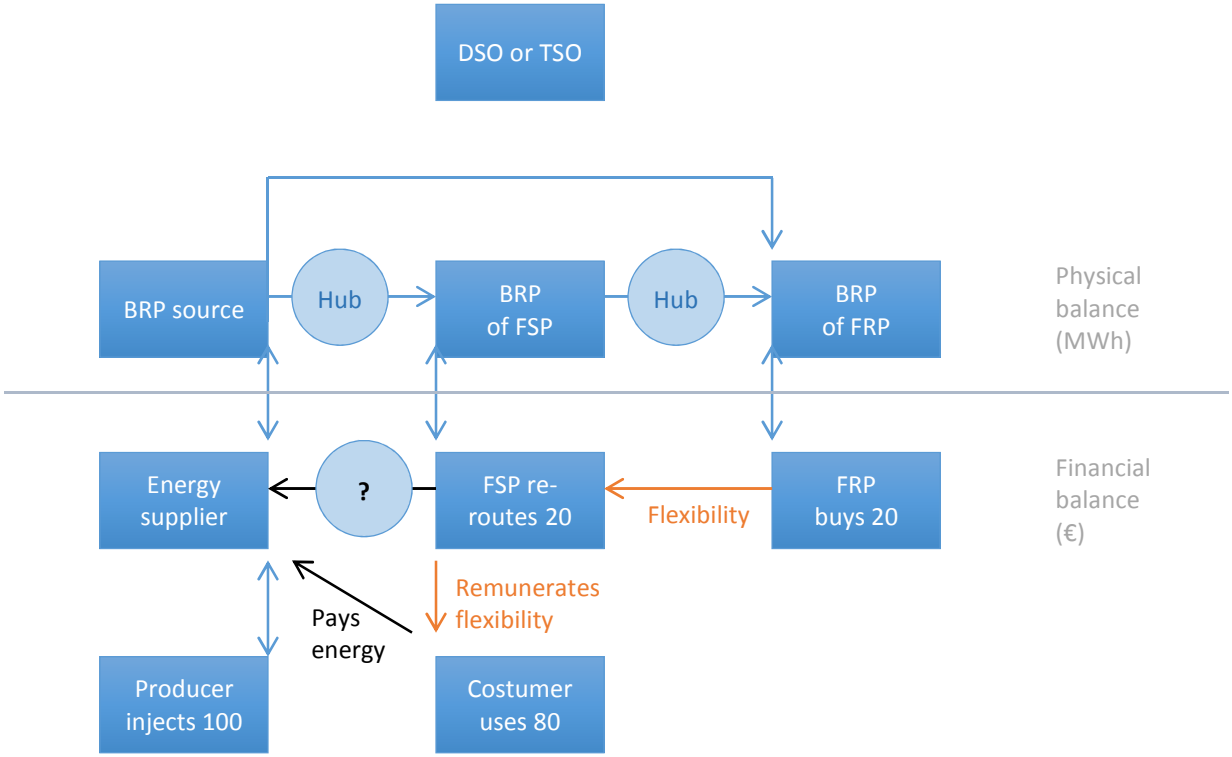
Dynamics

Dynamically, a vendor-consumer sells its flexibility to the FSP of its choice who, in turn, sells the flexibility either directly or through intermediaries to a BRP that needs to balance its portfolio.[85] Such intermediaries may include aggregators, FDMs and FRPs.[86]

In the most complex scenario, the vendor-consumer valorises its flexibility by selling it to an FSP that is associated to a BRP different from the BRP of its supplier. The FSP sells the flexibility to an FRP that can be either an entity operating in the balancing perimeter of a third BRP or a network manager that takes on balancing tasks.[87]

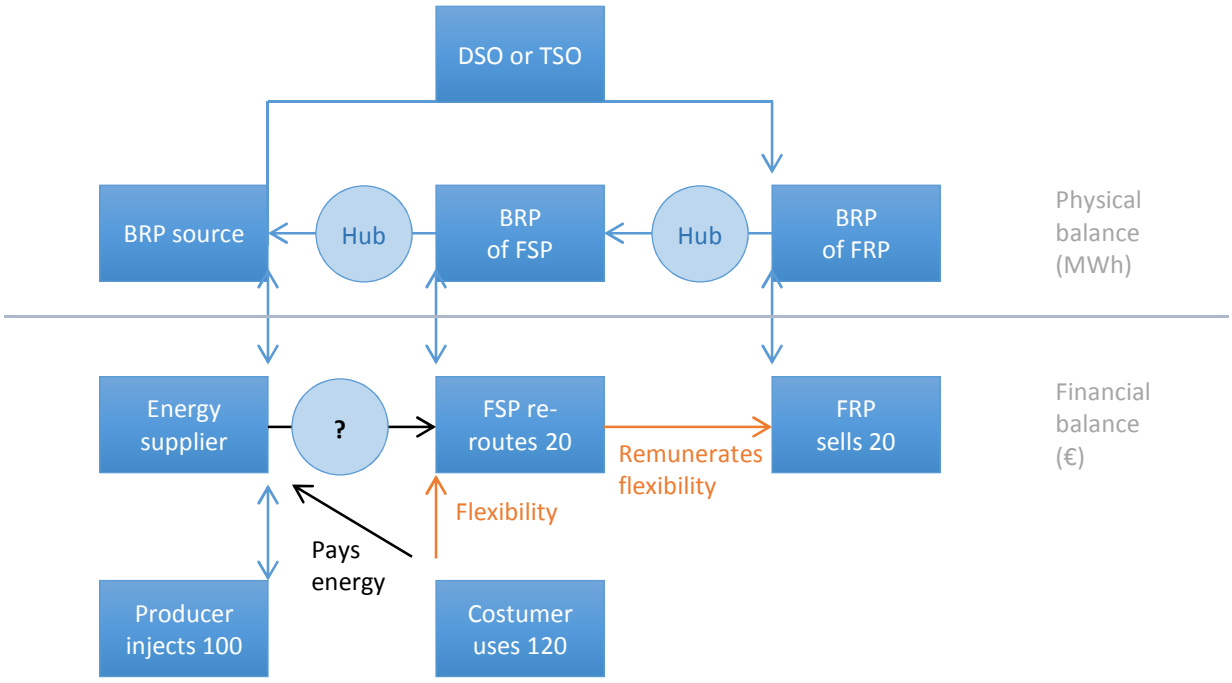
[85] Ibid, page 28-29.
[86] Ibid, page 28-29.
[87] Ibid, page 28.

Example 1: Complex flexibility activation in a bear market[88]



[88] Ibid, page 28

Example 2: Complex flexibility activation in a bull market[89]



In the first example, an activation of flexibility sold by the consumer reduces consumption (100-20 = 80) and liberates a given energy volume originally allocated to such consumer (100-80 = 20) for its transfer to an FRP. In the second example, we are dealing with the opposite case: The activation of flexibility increases consumption (100+20 = 120). In both scenarios, there is an energy transfer, which requires a regulatory framework that corrects imbalances in the bills of the supplier, its BRP and the vendor- consumer.[90]

3.3.5 Removing the second main obstacle: accessing energy products and markets

Adapting TSO products to be accessed by vendor-customers through BRPs

TSOs play a key role in the CREG model because they determine and settle imbalances in the portfolio of each BRP. To ensure that all flexibility offers can be taken into account by BRPs, CREG proposes that flexibility product definitions be based on TSO needs instead of on technological characteristics.[91] This criterion is in line with the principle of technology neutrality.

[89] Ibid, page -29.
[90] Ibid, page 29.
[91] Ibid, page 4.

A given technology can be excluded only if it is clearly unable to meet TSO need.[92] CREG sets concrete examples of modifications to current product definitions that, in its view, should be integrated into the convergence process towards an integrated balancing EU market.[93]

Developing products for electricity commodity market

CREG believes that the design of 15-minute products on both the Belpex Day-Ahead Market (DAM)[94] and Continuous Intraday Market (CIM)[95] to be beneficial for demand participation, especially if product development is coordinated with neighbouring countries.[96]

Based on its overall consultation phases, CREG thus proposes a market model for the transfer of energy that is based on the central management of data on capacity and a decentralised model of financial compensation, in case the various parties disagree.[97] CREG is in favour of a phased approach regarding the implementation of the model. This study only dealt with consumers whose consumption was measured every 15 minutes. In the future, the plan is to study and include consumers who are measured on a monthly or annual basis.

3.4 Testing CREG's Findings Against Today's DSO Challenges

Now that we have outlined the main characteristics of the CREG model, it will be examined how the model addresses the issues that have to be dealt with by the DSOs in an SES. The DSO is part of the CREG flexibility value chain but its regulation falls outside CREG's purview.[98] CREG proposes the development of current roles (supplier, TSO, DSO, BRP, aggregator and customer) and the legal definition of new ones (FSP, FDM and FRP). It can be inferred that in CREG's model DSOs can be BRPs[99] and play the role of FDM.[100] This will be analysed infra under "Active network management" and "Neutral market facilitation and data management", respectively. CREG does not discuss in detail how the DSO should adapt to these new roles. The issue of whether DSOs could become FSPs will be studied under "Participation in competitive markets".

[92] Ibid, page 4.
[93] Ibid, page 4.
[94] This market provides standardised products (i.e. hourly instruments) for market players selling and buying electricity to be delivered the day after via the Belgian transmission system operator Elia. Information available at http://www.belpex.be/trading-clearing/dam/, last retrieved on 2016-05-07.
[95] This market provides standardised products (i.e. hourly and multi-hourly instruments) for market players selling and buying electricity on a continuous basis, and this up to 5 minutes before delivery via the Belgian transmission system operator Elia. Information available at http://www.belpex.be/trading-clearing/cim/, last retrieved on 2016-05-07.
[96] Ibid, page 4.
[97] CREG, Final Report (n 35), p. 84.
[98] Ibid, page 49.
[99] Ibid, page 43.
[100] Ibid, page 43.

3.4.1 Neutral facilitator of market flexibility

CREG's model was designed with active network management in mind, as it becomes clear from its focus on demand participation and energy transfers. In their traditional role as grid operators, DSOs are responsible for maintaining operational safety on their grids in CREG's model.[101] The idea is that the facilitation of demand participation may enhance the development of flexibility markets. CREG is of the opinion that DSOs could improve certain aspects to encourage demand participation. Concretely, CREG proposes that DSOs make efforts to:

i. Reduce the complexity of proceedings for consumers sales of flexibility inasmuch as these can be influenced by DSOs (such as contractual frameworks);[102]
ii. Lower the costs associated with consumers' sales of flexibility;[103]
iii. Increase the regularity of consumption measurements;[104]
iv. Ensure the interoperability of technical equipment in cases where DSOs own it;[105]
v. Provide auxiliary services to the transmission network (such as validation controls at activation points) more dynamically.[106]

With regards to balancing, it can be inferred from the CREG model that DSOs can also be BRPs. For example, it is foreseen that DSOs ask TSOs to activate flexibility to transfer it.[107]

3.4.2 DSOs' participation in competitive non-core activities

As described above, suppliers, TSOs, DSOs, BRPs, aggregators, FSPs, FDMs and FRPs are part of the CREG flexibility value chain. It remains unclear up to which extent one player can assume multiple roles. For example, CREG states that suppliers can also be FSPs and implies that DSOs can be BRPs. DSO cannot be FSPs, as there is an incompatibility between these two roles. In a system where BRPs must systematically compensate FSPs if they deny their activation requests, these two players have conflicting interests. An additional conflict of interest between BRPs and FSPs is expressly mentioned by CREG when dealing with incentives for BRPs to exclude FSPs from lucrative markets (see below).[108] Since DSOs can be BRPs, it can be inferred that they cannot also be FSPs.

[101] Ibid, page 49.
[102] Ibid, page 14.
[103] Ibid, page 14.
[104] Ibid, page 15.
[105] Ibid, page 15.
[106] Ibid, page 50.
[107] Ibid, page 35.
[108] Ibid, page 17.

Moreover, CREG does not specify whether grid operators can engage in competitive markets. One the one hand, it states that DSOs and TSOs are not market players in this model;[109]and it proposes that TSOs offer to install sub-meters on their grids in competitive markets.[110] As regards DSOs, it must be recalled that their regulation falls outside CREG's remit, though the CREG report does not limit itself to the parts which falls under its jurisdiction (compare footnote 106).[111]

3.4.3 Data management

CREG does not make proposals for market facilitation outside the scope of energy transfers. Regarding data handling for energy transfer, CREG believes a neutral FDM should be designated.[112] The FDM is a centralised model for data management related to flexibility volumes that enables:[113]

i. The correction of the balancing perimeter of BRPs;
ii. The verification of the provision flexibility by FSPs.

CREG suggests that the TSO in collaboration with the DSO could play a central role as FDMs, since they are competent entities that do not actively participate in competitive markets.[114]

Regarding data related issues, according to regulatory principles 8 and 9: [115]

i. The end-consumer owns its metering data and can use these freely;
ii. Data confidentiality should be guaranteed.

Data owned by natural persons will be treated as personal data, subject to a Data Protection Impact Assessment under the newly adopted European General Data Protection Directive.[116] This means that data streams based on necessity, i.e. public interest or a legal obligation will be separated from those that are based on consent from the end-consumer. With regards to confidentiality, CREG distinguishes between the confidentiality of the FSP's client list and the price of the supplied energy. In CREG's view, FSP's refusal to disclose a list of activation points to the BRP does not seem justifiable with regard to big industrial clients for whom consumption is

[109] Ibid, page 43.
[110] Ibid, page 54-55.
[111] Ibid, page 49
[112] Ibid, page 43.
[113] Ibid, page 4.
[114] Ibid, page 43.
[115] Ibid, page 3.
[116] Ibid, 50; See the text of the Data Protection Regulation (entering into force 21 May 2016) and the Data Protection Directive (entered into force May 5 2016 and has to be transposed into national law by 6 May 2018). Documents available at http://ec.europa.eu/justice/data-protection/reform/files/regulation_oj_en.pdf and http://ec.europa.eu/justice/data-protection/reform/files/directive_oj_en.pdf, respectively (last retrieved on 2016-05-08).

measured precisely and in real time, as their supplier or BRP is likely capable of identifying the activation points by themselves.[117]

This does not necessarily hold for smaller end-consumers.[118] The disclosure information regarding their activation points would allow suppliers to benefit from the investments made by FSPs to identify flexibility sources within their client portfolio, thereby distorting competition.[119] This and other factors may allow for the protection of the confidentiality of activation points for smaller FSP clients and call for the intervention of a neutral, designated FDM.[120] This party would be informed of the flexibility activations within the area of a BRP and provide it with aggregated data if necessary.[121] CREG acknowledges that a supplier's refusal to disclose energy sales' prices is justified, since suppliers could also be FSPs and therefore obtain sensitive information from competitors.[122] Moreover, energy prices are cost-drivers for many industrial clients and their disclosure could distort competition in downstream markets.[123] Therefore, according to CREG, regulation should clarify which information is to be transmitted to which party, and sales' prices should normally be excluded without the express consent of suppliers and end-consumers.[124]

3.4.4 Systems operations and new contracts for the development of flexibility services

Also in the CREG model, legal and contractual obstacles should be abolished to enable consumers to enter into new types of flexibility contracts with the DSOs. These contracts serve as tools that can be used by the DSOs/TSOs for their system operations. The CREG model is designed to allow consumers to sell their flexibility through direct contracts with FSPs. As consumers have little experience with the conclusion of these types of contracts, they should receive transparent information regarding the different types of contracts and the implications for their personal situation.

3.4.5 Changing DSO-TSO relationship

In addition, the CREG framework considers a changing relationship between DS0s and TSOs. This confirms the need for new governance structures to enable new forms of TSO-DSO coordination and cooperation. CREG specifies certain competences within the proposed framework for energy transfers. TSOs set the communication protocol and technical standards for the

[117] Ibid, page 34.
[118] Ibid, page 34.
[119] Ibid, page 34.
[120] Ibid, page 34.
[121] Ibid, page 34.
[122] Ibid, page 34.
[123] Ibid, page 34.
[124] Ibid, page 34.

installation of sub-meters.[125] They may also install sub-meters in activation points connected to their network in a non-regulated, competitive market environment.[126]

FSPs or DSOs should inform each TSO of flexibility activations in the activation points connected to its network.[127] In a system of financial compensation following a ban to enable flexibility, the TSO pays (if necessary) overhead for transmission tariffs, surcharges and taxes.[128] Such payments can be disbursed to designated funds or made through billing corrections.[129]

Regarding ancillary products and services, TSOs:[130]

i. Give activation signals to manage response;
ii. Inform DSOs about flexibility activations on their network within a timeframe that allows the DSO to ensure grid security;
iii. Mandate flexibility activations and enforce potential penalties for non-compliance.

The regulation of DSOs falls outside CREG's remit. Despite this, CREG has adopted a clear position regarding certain DSO responsibilities.[131] For example, DSOs may restrict flexibility activations for duly motivated network safety reasons, paying appropriate compensation as defined by the legal or regulatory framework.[132] Similarly, to TSOs, they should be informed of flexibility activations on their network and pay overhead for distribution tariffs, surcharges and taxes as required by law.[133] Regarding ancillary products and services, DSOs mandate flexibility activations and enforce potential penalties for non-activation.[134] With a view to maintaining grid security, DSOs may conclude access contracts with FSPs that define rights and obligations for information sharing about the portfolio of flexible clients.[135] Additionally, DSOs could cooperate more with TSOs regarding flexibility data management[136] and billing of network costs and taxes.[137]

3.4.6 Adjusting network tariffs

CREG focuses on investment issues that negatively affect the business case for the sale of flexibility. It notes that such case is not promising for residential end-consumers in cases where

[125] Ibid, page 54-55.
[126] Ibid, page 54-55.
[127] Ibid, page 54-55.
[128] Ibid, page 54-55.
[129] Ibid, page 49 ff.
[130] Ibid, page 55.
[131] Ibid, page 55.
[132] Ibid, page 55.
[133] Ibid, page 55.
[134] Ibid, page 55.
[135] Ibid, page 55.
[136] Ibid, page 43.
[137] Ibid, page 49.

the consumption element of prices is relatively low, due to high investment costs, revenue uncertainty and the risk of exposure to contractual penalties.[138] Regarding the market for auxiliary services, CREG observes that the complexity and multiplicity of products hinders investment decisions necessary to further develop demand management.[139]CREG also quotes the joint response of CEER and ACER to the public consultation, in which structural barriers to the development of demand participation were identified. These barriers include costs relating to investment, R&D, and economies of scale that make procuring or providing flexibility costly.[140] According to CEER and ACER, these obstacles are particularly present in the markets for battery storage, where the cost/benefit ratio is too low to make this technology a competitive option.[141]

CREG does not address the issue of network tariffs. It focuses on commodity prices differences in energy prices within transfers. Regarding end-prices, CREG points out that a low consumption element of end-prices will negatively impact the business case for the sale of flexibility by residential consumers.[142] Additionally, CREG urges parties contracting with end-consumers not to expose them to higher tariffs for requiring services that are necessary for their participation in flexibility markets.[143]As for the market for ancillary services, CREG observes that an FSP can only submit competitive offers if its BRP shifts the windfall profit when it benefits from the difference between the selling price and the imbalance price (i.e. the price of demanded flexibility).[144] Otherwise, as demand increases and the market becomes more lucrative (e.g. because the imbalance price is tenfold the selling electricity price), BRPs may be incentivised to oppose the participation of FSPs in energy transfers.[145]

3.4.7 Congestion management and involvement in capacity planning

Congestion is either supply- or demand-driven and can be managed ex ante or ex post. CREG focuses on ex ante management of:

i. Supply-driven congestion by allowing DSOs to limit the activation of flexibility to maintain grid security;[146]
ii. Demand-driven congestion through higher demand participation in electricity markets. [147]

[138] Ibid, page 14.
[139] Ibid, page 15.
[140] Ibid, page 18.
[141] Ibid, page 18.
[142] Ibid, page 14.
[143] Ibid, page 14.
[144] Ibid, page 17.
[145] Ibid, page 17.
[146] Ibid, page 55.
[147] Ibid, page 2.

It should be noted that network security considerations do not shield operators limiting flexibility activation from financial losses.[148] If the grid operator must deny activation after exhausting all available re-dispatching options, it is still exposed to the payment of a penalty or of compensation based on imbalance prices.[149] CREG believes that this is necessary to avoid grid security issues from hindering the development of demand participation.[150] The system is completed by a bilateral mechanism of financial compensation between the FSP and the supplier of the vendor-customer.[151]

Flexible access contracts may help limit the compensation amount.[152] In CREG's view, such contracts could be temporarily justified in order to avoid network reinforcements due to the presence of only one additional flexible point.[153] This practice should, however, not be generalised because of two main reasons.[154] From a customer's perspective, it entails a limitation to the right to network access.[155] From a network management viewpoint, grid operators could maximise their profits and minimise investments.[156] Therefore, CREG recommends that a cost-benefit-analysis from a system perspective be carried out. This analysis should compare potential measures to restrict flexibility with possible network investments.[157]

3.5 Comparative Analysis of USEF and CREG

3.5.1 General observations

Despite different approaches, both the USEF and CREG models confirm that the role of the DSO is evolving (see Annex 3 for a detailed comparison of the models). At an abstract level, they confirm the main challenges that DSOs are faced with in a Smart Energy System. It is assumed that the DSO will be involved in local congestion management and balancing and will procure flexibility services for performing these tasks. The table in Annex 4 shows that both models as such do not conflict with the provisions of the Third Energy Package, though they leave many legal questions unaddressed. Except for privacy and security law, neither model provides a detailed legal assessment of the models within the framework of the Third Energy package, the Energy Efficiency Directive and national legislation. With the exception of the Data Protection Regulation, neither model is tested against horizontal provisions and directives, such as EU competition law and the EU consumer directives (see Annex 4 legal assessment). The

[148] Ibid, page 51.
[149] Ibid, page 51.
[150] Ibid, page 51.
[151] Ibid, page 4.
[152] Ibid, page 51.
[153] Ibid, page 51.
[154] Ibid, page 51.
[155] Ibid, page 51.
[156] Ibid, page 52.
[157] Ibid, page 51.

compatibility with EU energy law and competition law will largely depend on how the choices of the models are implemented in practice, for instance regarding the delineation of the DSOs' non-core activities about which the models are silent. The models leave room for the testing of different business models for the aggregators and other intermediaries. The exact specification and delineation of the roles of the DSOs and the other market parties will depend on the specific national markets, the flexibility products required in those markets and the national laws. For instance, the USEF model has been developed in the most strictly unbundled DSO/supplier context in Europe, which is a crucial factor to consider when implementing the model. National circumstances will also have to form the basis for designing the cooperation relations between the DSOs and the TSOs in a new market model. Furthermore, both models should develop how flexibility services can be designed in an efficient way in combination with the development of programmes for grid reinforcement and congestion management.

The models leave significant leeway for dealing with the challenges DSOs face, and do not provide answers to all challenges. Nevertheless, the report will examine what we can learn from the models regarding these challenges and what these lessons imply for what policy-makers, regulators, and DSOs can do when dealing with the different challenges that DSOs face.

3.5.2 Clarifying roles and responsibilities; facilitating market flexibility and neutral data management

In both models, the most pressing concern for DSOs is to ensure enough of the flexibility that is warranted to balance the intermittency of renewable generation at the (wholesale) market level. DSOs play a crucial role in facilitating the activation of flexibility resources connected to the grid (demand, distributed generation and storage). The models do not explicitly deal with the challenge regarding the division between the DSOs' core and non-core tasks. However, the models assume that DSOs will not act as a supplier of flexibility themselves, but will buy flexibility from existing and new market players. The DSOs are neutral market facilitators in both models. The models leave leeway for different business models for the combination of different roles such as aggregator, supplier and/or BRP (USEF) and for new market intermediaries (CREG).

Within this context, both models coincide with the EvolvDSO (2015) report regarding the most prominent new evolving tasks of DSOs:

i. DSOs now perform balancing tasks and must therefore purchase flexibility from aggregators and/or FSPs;
ii. DSOs are now in a position to facilitate of energy transfers through flexibility activations and participation in financial mechanisms between market players (such as suppliers and FSPs);
iii. DSOs are well suited to become neutral data managers in various transactions (such as flexibility procurement and activation);

iv. Data handling should be in line with privacy, security and confidentiality standards;
v. Conditions for data handling should be regulated and ensure that they do not create obstacles for competition and entry of new market participants.

So the models help clarifying the DSOs evolving new roles, but do not address in detail if and how European and national legal frameworks can accommodate these new roles.

3.5.3 Developing system operations; facilitating new contracts

The models confirm that new tools are required for distribution network system operation, in particular for local congestion management and the procurement of flexibility services for this task. Both models illustrate that new flexibility contracts will have to be concluded between DSOs and other market parties. They focus on relationships between the DSOs and the aggregators, though direct contracts between the DSOs and consumers may also be possible. The contracts should enable the development of the use of flexibility in system operations. Under certain circumstances, DSOs should be allowed to force curtailment on the network users under certain conditions. The conclusion of new flexibility contracts may require the removal of legal obstacles in the national legal frameworks and network codes, for instance as they have to allow aggregators/prosumers to enter flexibility markets.

As illustrated by the behavioural obstacles identified by the CREG, the engagement of consumers in demand response contracts and flexibility markets should be improved. Consumers should be well informed of the new possibilities for flexibility contracts and the implications for their situation. Consumers will not only have rights, but also responsibilities at the flexibility markets. In addition to the right to be informed about the contents and implications of new contracts and services, consumers also will have the responsibility to comply with the flexibility contracts. This responsibility is needed to ensure that the demand response contracts shall be performed in an optimal way. As recognised by the CREG model and the USEF model, DSOs should have access to information about congestion and connection points, to enable the DSOs to balance and manage the energy system in an optimal way. This entails that aggregators or consumers/prosumers should share relevant technical information regarding the connection of distributed generation and EV-charging stations with the DSOs.

3.5.4 Incremental risks of smart investments

Whereas both the Dutch and Belgian models acknowledge that flexibility is key, they depart from different perspectives and thus come to different conclusions on how to develop flexibility markets: CREG relies on regulation while USEF believes that market mechanisms will settle supply and demand for flexibility services. Neither model identifies specific risks associated with smart investments or elaborates on incentives to deal with these risks. The issue is handled at a quite general level and solutions vary. In the USEF model investments risks are mitigated by

long-term contracts between DSOs, Aggregators and BRPS in which flexibility services are monetised. Meanwhile, CREG believes that systematic compensation following refusals to requests to activate flexibility will ensure competition and investment (see 3.5.5.).

3.5.5 Adjusting network tariffs

Both models assume that network regulation and tariffs should be adjusted to account for the changing use of the network. It remains unclear how network tariffs should be structured in CREG's view, especially since a low consumption element negatively impacts demand participation but the capacity element is the main economic driver. In USEF, it is proposed that the tariffs promote "implicit demand response". This implies tariffs that are time dependent and local, such as time-of-use, and with dynamic or real-time pricing for both commodity and local grid optimisation. Neither the USEF model nor the CREG model provide definitive answers to the question on how to identify the most efficient structuring of network tariffs. This is probably due to the fact that the optimal tariff structure for each situation depends on local circumstances (characteristics of network, composition of network users and technology).

3.5.6 Congestion Management and capacity planning

Both models assume that DSOs can procure flexibility services for the performance of their congestion management tasks. CREG focuses on ex ante management of demand-driven congestion through higher demand participation in electricity markets. USEF assumes that a combination of ex ante congestion management and implicit demand response helps the DSO to fulfil its tasks. The extent to which the USEF model can contribute to the fulfilment of the DSOs' core tasks needs to be assessed on the basis of the results of the pilots in which the USEF model is tested. When ex ante measures are insufficient to prevent congestion, both models propose diametrically opposed solutions. In particular, USEF allows DSOs to curtail supply in order to protect grid security without incurring financial losses, while CREG does not.

In CREG's model, unlike any other network operator dealing with capacity constraints, DSOs have to pay compensations that amount to forced purchases of flexibility and even penalties if they deny a load activation after exhausting all available options to ensure grid security. As the exposure to payments is proportional to capacity constraints, the model of systematic compensation is harsher on grid operators that have invested less on network reinforcements. It is, however, unclear whether the framework will actually be able to incentivise network investments. Indeed, financial losses incurred by means of compensation and penalty payments may negatively affect DSOs capacity to invest. This would create risks for the achievement of a secure energy supply. While it is true that CREG proposes flexible access contracts to help limit the compensation amount, it only accepts them on an interim basis and does not allow for complementary measures.

Neither the CREG model nor USEF deal with the question how congestion management rules can be combined with the introduction of objective criteria for network reinforcements based on empirical network characteristics, such as network utilisation. Neither do the models incorporate the question if and how regulators should influence the location of distributed energy resources (or allow DSOs to do so), and if and how European and national legal frameworks should deal with these questions.

3.6 Observations

Two examples of frameworks of how different market models in an SES can look like (USEF and the CREG framework) were examined to study whether we can find solutions or suggestions regarding the question what can be done to tackle the main obstacles and gaps regarding the transition towards SES. The comparative analysis illustrates that both models confirm the challenges identified in section 2. Both models show that DSOs are well suited to act as neutral market facilitators, facilitating the development of market flexibility. They are also well suited to act as neutral data managers, provided that all data protection and security rules and standards are met and provided that data handling does not lead to competitive distortions favouring the DSOs' activities above the ones of their rivals. However, whether the models can actually deal with the challenges identified will depend on how they are implemented in practice. Therefore they provide only limited suggestions as to how the DSOs can cope with the challenges identified, but they help us to get a clearer picture of what needs to be done and if so how this could be done.

4. Conclusions and recommendations

This final chapter includes this report's main conclusions on the future role of DSOs and the authors' key recommendations on what, if any, adjustments to the current regulatory framework are warranted.

4.1 Facilitating market flexibility – main issues

The key challenge highlighted in this report is to ensure that the DSO is equipped to perform its role as a neutral market facilitator and to enable sufficient flexibility which is required to balance the intermittency of renewable generation at the wholesale market level. As discussed in this report, many of the resources (e.g. demand, distributed generation, storage) that can potentially provide flexibility are connected at the distribution level.

DSOs will play an important role in facilitating the activation of these flexibility resources. They will do so not necessarily directly or in a commercial function (as intermediary or supplier of flexibility), but rather in a system function through their control of (metering) data and physical installations (communication devices). They will also facilitate these flexibility resources through their necessary relations to TSOs, to network users, to aggregators and to the other players involved in supplying flexibility. In other words, the DSO must play a neutral market-facilitating role.

4.2 How to secure the new DSO role

Today, it is not yet clear which business models, whether developed by DSOs or other players, will be best suited to deliver optimal system flexibility. The case studies summarised in chapter 3, and in particular the USEF study, suggest a number of alternatives (see 3.1 and Table 1).

A European or national legal or regulatory framework should therefore ensure that alternative business models as developed by various actors in the emerging Smart Energy System can flourish. Frameworks should also allow these models to be tested for their potential to allow for the efficient entry of different types of agents or actors, including aggregators, software providers and other actors, as described in the CREG case study summarised in section 3.4. At the same time, both case studies confirm that DSOs' core responsibilities to develop, maintain and operate the distribution networks and to deliver high quality, reliable, efficient and safe distribution services for system users remain the same.

Given that DSOs vary considerably in size, organisation and in the scope of their functions across the 28 Member States, a "one-size-fits-all" approach to regulatory adjustment is ill suited for this reason alone. In addition, given that the transition process towards a Smart Energy System may be uncertain in its speed and duration, regulatory frameworks must be sufficiently flexible to reflect the dynamics of that process. Finally, any sector-specific regulatory adjustment should

be conditioned by the extent to which horizontal legislation on consumer protection and data protection, as well as competition law, proves inadequate to deal with the new challenges faced by DSOs and other market players.

A new role and responsibility for the DSO as a neutral market facilitator has, however, not yet been recognised in European electricity legislation, and this could give rise to legal uncertainty.

Recommendation #1

European legislation and national legal frameworks should assign the DSO the task of neutral market facilitation to ensure that flexibility services are available in the market and can be procured for the fulfilment of core DSO tasks in an efficient, affordable and secure way. Any regulatory adjustment should leave sufficient scope for DSOs and new market entrants to develop and test different business models for the transition to a Smart Energy System.

4.3 Developing system operations – new contracts for the development of flexibility services

New economic, legal and technical tools are required for the distribution network system operations, in particular for local congestion management. Unlike the above neutral market-facilitating role, here the role of the DSO necessarily has a commercial aspect.

One such tool is to procure flexibility services to prevent congestion through voluntary or, where appropriate, regulatory agreements with network users.

As system operator, DSOs may contract directly with network users for demand management/curtailment, but they may also buy flexibility through third parties (such as aggregators).

Any adjusted regulatory framework should encourage DSOs to develop the use of flexibility tools in their system operations, especially where this may reduce the cost of building and operating their networks.

In addition, DSOs may be given the power to force curtailment on network users in certain circumstances. It should also be considered whether legislation should allow DSOs to make provision for load curtailment, without sanction (financial compensation), which depends on the question of whether or not network users are granted capacity rights. As such, DSOs will require accurate and up-to date information on the location of relevant generation and consumption installations.

More generally, there should be no explicit restrictions on what technical data a DSO can receive (as input), but how it subsequently uses that data beyond its system operation tasks (as output). This may require further monitoring and eventually, specific regulatory solutions if general competition law is not enough.

Data protection issues for consumers are separate (see below).

Recommendation #2

European and national legislation should provide sufficient flexibility for DSOs to conclude voluntary (and where deemed necessary, regulated) flexibility agreements with system users – either directly or through a third party. Legislation should also consider under what circumstances DSOs are allowed to make provision for load curtailment as well as ensure that they have access to relevant technical data on location of generation and consumption facilities.

Domestic customers who produce and sell energy back to the network may decide to conclude contracts with third parties such as aggregators or with the DSO. As they may be in a weaker bargaining position vis-a-vis either party, consumers who are at the same time prosumers should benefit from the protection provided under both the Electricity Directive and general consumer law. This legislation may therefore require amendment to ensure that prosumers enjoy the same level of protection when selling flexibility to commercial parties.

Recommendation #3

Outright bans for the conclusion of direct contracts between consumers/prosumers should not be considered unless the protection afforded by general consumer protection and data protection proves to be inadequate. Consumers/prosumers should be free to choose whether they wish to contract directly with the DSO or other third parties supplying flexibility services. Prosumers should enjoy the same level of protection as domestic consumers.

4.4 DSO Participation in potentially competitive non-core-activities

DSOs will be required to perform their new tasks as neutral market facilitators but they may also become involved in the market for the provision of non-core services that are potentially also competitive activities. In the light of the current unbundling rules, this remains a grey area. Non-core activities that are not essentially linked to network operation may be performed by various market parties, including new entrants. At the same time, DSOs may benefit from synergies in carrying out both core and non-core tasks. An outright ban on the provision of commercial services by DSOs is not necessary as there are many options available to ensure that the DSO can still act as a neutral market facilitator and refrain from discriminating in favour of its own services. As actual levels of competition will be country- or region-specific, and as a perceived absence of competition may only be transitory, the delineation of non-core tasks should not be centralised at a European level. Competition law remedies may be sufficient to deal with potential distortions.

Recommendation #4

European legislation could require Member States to distinguish between core and non-core tasks while leaving it up to Member States to determine the exact scope of the latter category in the light of actual levels of competition in their jurisdictions. National regulatory authorities

could be given the power to supervise the conditions under which DSOs participate in non-core activities and to check that DSOs do not discriminate between their own non-core services at the expense of other market players.

4.5 Adjusting tariff structure

Tariffs should be adjusted (in dimensions such as connection, capacity, energy, time, location, network conditions) to account for the changing use of distribution networks, resulting from deployment of distributed generation and co-location of generation and consumption installations. Such adjustments should take into account how tariffs may influence the use of networks, including decisions by network users to disconnect and rely on self-generation.

The adaptation of new smart technologies not only extends the possibilities for how tariffs may be structured (especially in time and in relation to network conditions), but also influences how, and the extent to which, networks users respond to tariffs. The optimal tariff structure will depend on the characteristics of the network, the composition of network users and technology (esp. smart meters).

Regulations should therefore allow, and indeed encourage, national regulatory authorities to design tariff structures according to local conditions.

Recommendation #5

Distribution tariffs should not be regulated at the European level (except for some fundamental principles). On the contrary, regulation should encourage national regulatory authorities to design tariff structures according to local conditions. However, tariff regulation should recognise common challenges, including the need for innovation and investment in smart grid infrastructure, neutral treatment of different types of costs (such as OPEX and CAPEX expenditures), different use of the network by different users, the need for flexibility at the local level, signals for efficient network use and the need to incentivise synergies offered by DSOs towards other sectors.

4.6 Involvement in capacity planning and congestion management

Decisions about where to locate distributed generation and consumption installations (including charging stations for electrical vehicles and storage units) should take account of the associated cost of expanding and operating the network (including maintaining network stability/reliability).

At the very least, authorities who provide licenses, or in other ways decide where electricity generation and consumption installations may be located, should consult with DSOs about implied costs to the network.

National regulatory authorities should be allowed to design tariff structures, by geographic area, that encourage efficient location. DSOs may need to play an active role in the selection of distributed resources which can offer balancing services that can be connected to their networks. This can guarantee a geographical coherence between the localisation of balancing resources and the localisation of constraints as may be determined by the DSO.

It may also be considered whether DSOs should be given some powers with respect to location decisions, for example the right to veto connections that are either very costly or undermine the integrity of the network, and/or the power to direct certain installations (e.g. large storage units) to specific locations.

Recommendation # 6

While it may be useful for European legislation to set out certain basic principles with respect to the DSO's role in congestion management, detailed regulation is not required. National legal obstacles preventing DSO involvement in network reinforcement and congestion management should be removed. If DSOs are given such powers, they should not at the same time be engaged in providing similar services themselves (e.g. storage), as there would then be more scope for discrimination. Trade-offs are therefore to be considered. As already indicated, this does not necessarily mean imposing a complete ban. There are many options available to ensure transparency, in such a way that if DSOs are involved in commercial services, these are being provided at arm's length and DSOs are not in a position to favour their services above those of rivals.

4.7 Handling data

An important function of the DSO as neutral market facilitator is data handling. Unlike the technical data required for system operation tasks, which may require monitoring and/or specific regulation to the extent that competition law is not sufficient, data protection issues for consumers should be dealt with by general legislation.

European and national legal frameworks should ensure that DSOs receive from the system users all the necessary data they require for an efficient and secure performance of their system operation tasks. They may also be allowed to share commercial data generated by smart meters and/or acquired within their system operation tasks with other commercial players, provided that privacy and confidentiality standards are met, in order to facilitate the development of flexibility markets. In many cases, data can be both technical and commercial. For instance, the capacity of a connection is a technical data element but is also used in commercial contracts. Therefore, different categories of data could be established by determining for what purpose the data is used.

Data handling may distort competition in energy services markets if DSOs have access to commercially relevant data and make use of it to favour their activities in competitive markets. As competition law only provides general norms for data exchange (e.g. non-discrimination and

transparency principle) and can only remedy competition law violations ex post, new rules may be needed to deal with these challenges. This will also depend on the degree of legal and/or economic unbundling of the data handling activities from the commercial services. To guarantee legal certainty, basic legal principles and rules regarding data management may be included in the European energy directives. These provisions could provide the basic principles for data handling and distinguish different types of data on the basis of the use that is made of the data, by whom the data can be exchanged and under which conditions.

The handling of different types of data (technical and/or commercial data) may also entail the disclosure of confidential information and may impact the consumers' privacy. Data protection issues for consumers/prosumers are covered by general privacy legislation and additional specific privacy rules should be prevented to the extent possible. Therefore, all rules and standards concerning data handling should be consistent with general European privacy legislation (General Data Protection Regulation). In line with USEF, parties active in a Smart Energy System should work on open, transparent and objective technical, privacy and security standards that ensure the interoperability of all smart energy services, networks and devices.

Recommendation #7

Considering the inherent limits of competition law, European and national legal frameworks should provide the basic principles for neutral data management (e.g. non-discrimination, transparency, neutrality). Any regulation concerning data handling should be based on a deep understanding of the use of different types of data, foster competition and innovation. It should also be justified by the limited possibilities of competition law to prevent anti-competitive behaviour.

4.8 TSO-DSO Coordination

As acknowledged by the USEF and the CREG frameworks, the energy transition calls for a re-alignment of the responsibilities and interaction between DSOs and TSOs. Current European and national legal frameworks do not yet recognise the increased interaction and need for cooperation between DSOs and TSOs. As DSOs may partly take over some of the TSOs responsibilities, such as local balancing and (local) congestion management, the DSOs tasks could affect the roles and responsibilities of the TSOs. This makes TSO-DSO coordination in the area of grid planning, grid management and security, as well as data management, necessary

To enhance legal certainty, European and legal frameworks should fill this gap and provide a legal basis for increased TSO-DSO coordination and cooperation. New roles and relationships also call for the revision of governance structures. In contrast to the distribution system operators, the transmission operators, through ENTSO-E (the association of European transmission system operators), play an important role in the design of the European network codes for the regulation of the transmission grids. Similarly, the participation of the DSOs in

European procedures for the adoption of network codes for the regulation of transmission and distribution grids has not yet been institutionalised.

Recommendation #8

European and national legal frameworks should make explicit that DSOs, in order to fulfil their core duties in an efficient and secure way, can be involved in local balancing and local congestion management tasks by using resources connected to their network. Legal frameworks should encourage TSOs and DSOs to foster cooperation and allow for regulatory and/or contractual arrangements that clearly define responsibilities with regard to grid planning and operation, grid management and security and data management. Detailed regulation can be adopted at the national level taking into account the specific needs of DSO-TSO cooperation in each Member State or region. Governance structures should be revised in order to enable DSOs, involved in local balancing and congestion management tasks, to represent evolving roles and responsibilities in European network organisations.

5. Annexes

5.1 Annex 1: Overview and Explanation of Relevant Legal Rules Regulating the DSO

Overview of the EU Common Rules for the Internal Market for Electricity

It is important to understand what is meant by 'distribution' in the context of the DSO. **Article 2.5** of the Electricity Directive stipulates that 'distribution' constitutes the transport (but *not* supply) of electricity with a view of delivery to its customers. In the same vein, Article 2.5 of the gas directive sets out that gas distribution implies the transportation (but *not* supply) of gas through regional pipeline networks with a view to delivering it to the customers.

Chapter VI of the Electricity Directive (Articles 24-29) sets out the tasks and duties of the DSOs.[158] Pursuant to Article 24 of the Electricity Directive, EU Member States must make sure to have one or more DSOs in place.

With respect to the underlying contractual relationship between the DSO and the System User, **Articles 25-29** are especially relevant:

Article 25 prescribes the DSO's responsibility to develop an economically secure and reliable electricity distribution, with due regard for the environment and energy efficiency (para 1). More importantly, DSOs have to operate according to the principles of non-discrimination, as they must not discriminate between system users or classes of system users, particularly in favour of its related undertakings (para 2). In the *VEMW* case, the ECJ elaborated on this notion of non-discrimination.[159] For instance, the ECJ takes account not only of the wording, but also of the context in which discrimination occurs and the objects of the rules of which it is part (ground 41 and Lavrijssen 2013, page 10). Additionally, the non-discrimination obligation imposed on the Member States and grid managers is a specific expression of the general principle of equality (ground 47 and Lavrijssen 2013, page 10). Finally, under the prohibition on discrimination, which is a fundamental principle of EU law, comparable situations must not be treated differently unless such difference in treatment is objectively justified (ground 48 and Lavrijssen 2013, page 10).

Nevertheless, a Member State may require the distribution system operator, when dispatching generating installations, to give priority to generating installations using renewable energy sources or waste or producing combined heat and power (para 4). Para. 3 of Article 25 further states that each distribution system operator shall provide any other system users with sufficient information they need for efficient access to, including use of, the system.

[158] Chapter V, Articles 24-29 of the Gas Directive respectively.
[159] ECJ Case C-17/03 *VEMW v. Directeur van de Dienst uitvoering en toezicht energie*, ECR 2005, p. I-4983 and Lavrijssen 2013

Moreover, each distribution system operator shall procure the energy it uses to cover energy losses and reserve capacity in its system according to transparent, non-discriminatory and market based procedures, whenever it has such a function (para 5).

Where a distribution system operator is responsible for balancing the distribution system, rules adopted by it for that purpose shall be objective, transparent and non-discriminatory, including rules for the charging of system users of their networks for energy imbalance. Terms and conditions, including rules and tariffs, for the provision of such services by distribution system operators shall be established in accordance with **Article 37(6)** in a non-discriminatory and cost-reflective way and shall be published (para 6).

Finally, when planning the development of the distribution network, energy efficiency/demand-side management measures, or distributed generation that might supplant the need to upgrade or replace electricity capacity, shall be considered by the distribution system operator (para 7).

Article 26 further sets out that if the DSO is part of a vertically integrated undertaking, it has to be independent in legal form, organisation and decision-making (para 1). In case the DSO is part of a vertically integrated undertaking, it has to ensure that it is independent from this undertaking in terms of its organisation and decision-making from the activities that are not directly related to distribution (para 2).[160] Moreover, the regulatory authorities of the Member State in question have to monitor the functioning of the DSO to prevent the distortion of competition (para 3). However, it should be noted that Members States may chose not to apply paras 1 to 3 of Article 26 to integrated electricity undertakings serving less than 100.000 customers (para 4).

Article 27 prescribes that the DSO must preserve the confidentiality of commercially sensitive information obtained in the course of carrying out its business, and shall prevent information about its own activities which may be commercially advantageous being disclosed in a discriminatory manner.

Article 28 concerns closed distribution systems, i.e. where electricity is distributed in a geographically confined industrial, commercial or shared services site (para 1). In those instances, Member States may provide for national regulatory authorities to exempt the DSO of a closed system from the obligations set out in Article 25 (5) (procurement according to transparent, non-discriminatory and market based procedures) (para 2(a)). The same applies to the calculation of tariffs, which normally have to be approved prior to their entry into force pursuant to Article 32(1) and 37 of the Electricity Directive (para 2(b)).[161]

[160] The minimum criteria are set out in subparagraphs (a) to (d), Article 26 (2).
[161] In this instance tariffs may be reviewed and approved upon the request of a user of the closed system (Article 28 (3))

Article 29, lastly, provides for the operation of a combined transmission system operator and DSO, notwithstanding the obligation set forth in Article 26(1). A combined operator does have to comply with Articles 9(1) (Unbundling of Transmission System Operators), or 13 (Independent System Operator) or 14 (Unbundling of transmission system owners) and Chapter V (Independent Transmission System Operator) or Article 44(2) (derogation for Cyprus Luxemburg or Malta) of the Electricity Directive.

The EU Energy Efficiency Directive

The 2012 EU Energy Efficiency Directive (2012/27/EU) also provides for relevant rules that regulate the DSO's behaviour vis-à-vis the system user.

Article 10 prescribes that in Members States where final costumers do not yet have smart meters, Members States have to ensure that billing information is accurate and based on actual consumption, including those of DSOs (para 1).

Moreover, **Article 15** in para 5 obliges Member States to ensure that DSOs, in case they are in charge of dispatching the generating installations in their territory: a) guarantee the transmission and distribution of electricity from high-efficiency cogeneration; b) provide priority or guaranteed access to the grid of electricity from high-efficiency cogeneration; c) when dispatching electricity generating installations, provide priority dispatch of electricity from high-efficiency cogeneration in so far as the secure operation of the national electricity system permits.

Further, in case this is technically and economically feasible, high-efficiency cogeneration operators can offer balancing services and other operational services at the level of DSOs. These, in turn, shall ensure that such services are part of a services bidding process which is transparent, non-discriminatory and open to scrutiny (para 6).

Article 16 obliges Member States to ensure that DSOs, in meeting requirements for balancing and ancillary services, treat demand response providers, including aggregators, in a non-discriminatory manner, on the basis of their technical capabilities. Member States shall further promote access to and participation of demand response in balancing, reserve and other system services markets, inter alia by requiring national energy regulatory authorities and distribution system operators to be in close cooperation with demand service providers and consumers, including aggregators (para 8).

Article 18 further sets out that Members States must ensure DSOs refrain from any activities that may impede the demand for, and delivery of, energy services or other energy efficiency improvement measures, or hinder the development of markets for such services or measures, including foreclosing the market for competitors or abusing dominant positions (para 3). While the DSO may participate in these non-core competitive markets, they cannot act in a way that hinders competition.

Annex VII of the Energy Efficiency Directive gives the minimum requirements for billing and billing information based on actual consumption. Bullet point 1.3 states DSOs should inform their customers in a clear and understandable manner where they can obtain advice on available energy efficiency measures, benchmark profiles for their energy consumption and technical specifications of energy using appliances that can serve to reduce the consumption of these appliances.

Last but not least, **Annex XII** lists the energy efficiency requirements for DSOs. They must:

- Set up and make public their standard rules relating to the bearing and sharing of costs of technical adaptations, such as grid connections and grid reinforcements, improved operation of the grid and rules on the non-discriminatory implementation of the grid codes, which are necessary in order to integrate new producers feeding electricity produced from high-efficiency cogeneration into the interconnected grid;
- provide any new producer of electricity produced from high-efficiency cogeneration wishing to be connected to the system with the comprehensive and necessary information required, including an estimate of the costs and a timetable (it is unclear to what extent this information includes consumer data, and other information such as data management);
- provide standardised and simplified procedures for the connection of distributed high-efficiency cogeneration producers to facilitate their connection to the grid.

EU Public Service, Customer and Consumer Protection Obligations

Aside from the duties and task of the DSOs themselves, the Electricity Directive in **Article 3** also extensively provides for Public Service Obligations and Customer Protection.

Public Service Obligations

Regarding Public Service Obligations, para 1 of Article 2 prescribes that Member States have to ensure that electricity undertakings are operated in accordance with the principles of the Electricity Directive with a view to achieving a *competitive*, *secure* and *environmentally sustainable* market in electricity, and shall not discriminate between those undertakings as regards either rights or obligations. As DSOs are part of the greater electricity undertaking, they have to make sure they abide by these principles in their functioning as well.

Para 2 provides that Member States may impose public services obligations on undertakings operating in the electricity sector, if they are in the general economic interest. These obligations may again relate to *security*, including *security of supply*, *regularity*, *quality and price of supplies* and *environmental protection*, including *energy efficiency*, *energy from renewable sources* and *climate protection*. Such obligations have to be clearly defined, transparent, non-discriminatory, and verifiable and shall guarantee equality of access for electricity undertakings of the Community to national consumers. In order to ensure these goals, Member States may introduce the implementation of long-term planning, taking into account the possibility of third parties seeking access to the system.

In short, the DSO has to respect public services obligations and to act in a manner that is **competitive, secure** and **environmentally sustainable.**

Customer Protection Obligations

Article 3.3 provides that:

> 'Member States shall ensure that all household customers, and, where Member States deem it appropriate, small enterprises (namely enterprises with fewer than 50 occupied persons and an annual turnover or balance sheet not exceeding EUR 10 million), *enjoy universal service, that is the right to be supplied with electricity of a specified quality within their territory at reasonable, easily and clearly comparable, transparent and non-discriminatory prices.*
>
> To ensure the provision of universal service, Member States may appoint a supplier of last resort. *Member States shall impose on distribution companies an obligation to connect customers to their network under terms, conditions and tariffs set in accordance with the procedure laid down in Article 37(6).* Nothing in this Directive shall prevent Member States from strengthening the market position of the household, small and medium-sized consumers by promoting the possibilities of voluntary aggregation of representation for that class of consumers.' [Emphasis added].[162]

Consumer Protection Obligations

The general rules of EU consumer protection apply to household customers that buy energy for their own use. These are the EU Consumer Rights Directive 2011/83/EU of 22 November 2011, Directive 97/7/EC of the European Parliament and of the Council of 20 May 1997 on the protection of consumers in respect of distance contracts and Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts. Consumer protection provisions in the energy directives can be seen as a *lex specialis* of general EU consumer law, as acknowledged by the European Court of Justice.[163]

In addition to Article 3 of the Electricity Directive, Annex I of the Directive also provides for measures on consumer protection. Annex I under subparagraph a) stipulates that the consumers have a *right to a clear contract* that provides the identity of the supplier; the services provided; the types of maintenance offered; includes means to provide for up to date information on tariffs; the duration of the contract; rules on compensation; methods of dispute settlement; and, adequate information relating to consumer rights. Consumers have to be given adequate notice of any intention to modify the contract (subpara b); have to receive transparent information (subpara c); are offered a wide choice of payment methods (subpara d); and, are not charged for changing supplier (subpara e). They also have a right to benefit from

[162] Article 3.3 of The Electricity Directive (Dir 2009/72/EC)
[163] ECJ Case 92/11, *RWE Vertrieb v. Verbraucherzentrale Nordrhein-Westfalen eV*, 2012 E.C.R. (Advocate General V. Trstenjak's Conclusion at point 69) and Lavrijssen 2014, page 12.

transparent, simple and inexpensive procedures dealing with their complaints (subpara f); have to be well-informed about their rights regarding universal service (subpara g); have their consumption data to their disposal (subpara h); are properly informed of actual electricity consumption (subpara i); and, receive a final closure account following change of supplier (subpara j).

Last but not least, the Annex in para 2 prescribes that Member States shall ensure the implementation of intelligent metering systems that assist in the active participation of consumers in the electricity market.

5.2 Annex 2: Current text of Belgian Electricity Law vs. Amended text proposed by CREG

Current Belgian Electricity Law	Amendments proposed by CREG
Art 2: For the purposes of this Act must be understood:	**Art 2:** For the purposes of this Act must be understood:
1. […]	1. […]
	27 °bis to "demand flexibility": this means the ability of an end customer to voluntarily net decrease, upward or downward, to adjust when response to an external signal;
	27 °ter "service flexibility": using an intermediary for the activity of demand flexibility from one to several end customers, of which he is not a supplier;
	27 ° quarter "manage data flexibility": means the individual or legal person designated in accordance with article 16bis, § 3;
Art. 8. Para 1 […]	**Art. 8. Para 1 […]**
To this end, the operator shall be responsible for the following tasks:	To this end, the operator shall be responsible for the following tasks:
1. […]	1. […]
ensuring a secure, reliable and efficient electricity system and, in this regard, ensure that the necessary support services are available and be implemented, provided that availability is independent from any other transmission system with which its system is coupled. Support services include in particular the services issued in response to the question of emergency services in the event of failure production units, this includes units based on renewable energies and qualitative cogeneration. For activation of the means of production necessary are to the equilibrium of the control area to assure the grid gives priority to the use of a transparent market platform;	2 ° ensuring a secure, reliable and efficient electricity system and, in this regard, ensure that the necessary support services are available and be implemented, provided that availability is independent from any other transmission system with which its system is coupled. Support services include in particular the services issued in response to demand, activation of the demand flexibility included, and emergency services in the event of loss of production units, taking included units based on renewable energies and qualitative cogeneration. For activation of the means of production and the question of flexibility which are necessary for the to ensure equilibrium of the control area, the network operator will prioritise to use of a transparent market platform;

Current Belgian Electricity Law	Amendments proposed by CREG
	[…]
	Art. 16bis. § 1. Each end customer has the right to valorise its demand flexibility and can appeal to a flexibility of service provider of their choice.
	§ 2. Each end customer is the holder of his measurement data and can freely pass to persons of his choice. He or she must have this data available within the time specified, consistent with the processes for the enhancement of flexibility.
	Art. 16ter. On a proposal of the committee the King will adopt, by means decree adopted after Cabinet discussion, the rules on the organisation of the energy transfer via a service provider of flexibility.
	These rules include:
	1 ° the conditions that intermediaries must meet to be able to act as service providers of flexibility;
	2. the award procedure and the withdrawal of the necessary license to works as a service provider or flexibility;
	3 ° the principles that should be applied to the flexibility volume determined by the activated demand;
	4 ° the principles for the quarter imbalance correction that has emerged from the activation of the demand flexibility by a service provider of flexibility;
	5 ° the principles to be applied in the absence of a negotiated solution, in the form of a fixed price for the transfer of energy in case of activation of the demand flexibility, subject to Article V.2 the Code of Economic Law.
	The committee may, if it deems necessary to facilitate the transfer of energy, impose on the Parties a model agreement.
	Art. 16 quarter § 1. The King appoints, on advice of the committee, an administrator flexibility of data.
	§ 2. The operator of flexibility data is responsible for the following tasks:

Current Belgian Electricity Law	Amendments proposed by CREG
	1° For approval by the committee, present methodologies which make it possible to guarantee the principles, which were adopted in Article 16b, paragraph 2; 3 ° and 4 ° for the day-ahead market, the intraday market, market to compensate for the quarter imbalances and strategic reserve;
	2 ° Collect the information needed for the transfer of energy, and monitor, process and transfer, according to the activation of the flexibility of demand through a service provider for flexibility;
	3 ° ensure to observe the market to identify possible manipulations of the determination of activated volumes and, where appropriate, report such manipulations to the committee.
	§ 3. Following the opinion of the committee, the King shall determine:
	1. Further detailed rules regarding the commands of the operator of flexibility data;
	2. the terms of appointment referred to in the second paragraph. In his request for appointment, the candidate has to show that he meets these requirements and is able to perform the tasks referred to in this article;
	3 ° the framework under which the administrator of flexibility data cooperates with the persons who, by the competent authorities, were charged with the collection of measuring data.
	§ 4. If the operator was designated as manager of the flexibility data, then the costs for the exercise of his duties should be covered by the appropriate regulatory mechanisms provided for in the tariff methodology referred to in Article 12.
	§ 5. The administrator of flexibility data ensured that he treats commercial information he is exposed to in the exercise of his activities confidentially and shall prevent the dissemination of such confidential information.

5.3 Annex 3: Comparative Table - General features of USEF and CREG's frameworks

	USEF	CREG
Type of initiative	Bottom up, private sector initiative; Publicly available private standard, aims to become the standard for SES	Top down initiative from the federal regulator with input from stakeholders; aims at increasing demand participation through the design of a regulatory framework
Current state	Framework developed in theory; Pilot stage; two projects in the Netherlands	Framework developed after public consultations; final report with proposed draft legislative amendment
Core versus non-core functions	Not discussed in the model; of non-core tasks, 'Flexibility services' are central to USEF	Not discussed in the model; amongst non-core tasks, flexibility is key
Investment regime	Need for long-term contracts ('Long-term Flex'), flexibility has to become reliable and financially attractive	BRPs must systematically compensate FSPs if they deny their activation requests, even for security reasons. IN CREG's view this will lead to more demand participation, lower prices and higher levels of investment.
Consistency with legal framework	Unclear from USEF itself, except for privacy and data security (consistent).	Unclear from CREG itself, except for privacy and confidentiality (consistent).
How are DSO challenges dealt with?	a) Active network management is foreseen; b) Data management is compliant with current EU privacy and data laws; c) Neither participation in competitive markets nor conflicts of interest are addressed; d) Direct contracts DSOs and consumers are not envisaged; Aggregator is seen as solution to intermediate and introduce flexibility to the grid; e) More interaction between TSO and DSO foreseen; f) Incremental risks of smart investments: Long-term	a) Active network management is foreseen; b) Neutral data manager for flexibility transfers; framework compliant with current EU privacy and data laws; c) Participation in competitive markets is not specifically addressed but conflicts of interest exist; d) Direct contracts DSOs and consumers are not envisaged, but it is stated that, in general, contracts with prosumers should not hinder their market participation. e) SES-based division of tasks

	USEF	CREG
	contracts needed to mitigate risk and protect in case of market failure 'Long Term Flex'; flexibility has to become reliable and financially attractive; g) Tariffs: 'Implicit demand response', (time-of-use, dynamic or real time pricing h) Congestion management: Ex ante congestion management by active management Aggregator and DSO; Ex post congestion management possible without systematic compensation/penalty payments.	and more interaction between TSO and DSO foreseen; f) Incremental risks of smart investments: Not specifically addressed. g) Tariffs: Not addressed. It is only mentioned that a low consumption element does not appropriately incentivise demand participation. This is an issue, especially when considering that the capacity element is the main economic driver. h) Congestion management: Ex ante management through increased demand-flexibility; Ex post congestion management through curtailment associated with compensation/penalty payments. Flexible access contracts may limit the compensation amount but are allowed only as a temporary measure.

5.4 Annex 4: Comparative Table Consistency of USEF and GREG's framework with Core Legal Principles Applicable to DSOs

This table put forward our assessment of the compatibility of each of the frameworks under study against the benchmark of the principles explained in section 1.b. of this report.

	USEF	CREG
I – EU Data Protection and Privacy		
Data ownership	Not specified.	Consumers own metering data and can use it freely
Data classification	Not specified	Distinction between data to validate transactions and data necessary to maintain grid security
Data Privacy	Consistent with 2016 Data Protection Regulation and Directive	CREG expressly mentions that compliance with privacy law must be insured when applying its model; data infringing privacy rights cannot be divulged
Data security	Consistent with 2016 Data Protection Regulation and Directive	Not expressly addressed
II – Consistency with Electricity Directive		
Responsibility for operation, maintenance and development of the grid (Art 2.6)	Yes. The market models in USEF are supposed to take this into account	BRPs are defined as entities responsible for correcting electricity imbalances and DSOs are described as being responsible for maintaining operational safety on their grids
Distribution in secure and economically reliable manner (Art 25.1)	Yes, USEF aims to accomplish this by monetising flexibility (UFLEX) and the conclusion of long-term contracts.	CREG aims at accomplishing this by encouraging demand response through FSP competition and prosumer compensation in case of non-activation (from BRPs via FSPs)
Independence in legal form (Art 25.2 and Art 26.1)	Not necessarily guaranteed, depends on the roles and the relations between the various market players in USEF.	Not addressed by CREG but not incompatible with the model
Non-discrimination between system users (Art 25.2)	Is not mentioned in the framework, but is presumed	Non-discrimination between FSPs by BRPs and suppliers is

	USEF	CREG
	to operate in a non-discriminatory manner.	the whole purpose if CREG's model; non-discrimination of prosumers is a necessary result
Providing sufficient information to system users (Art 25.3)	Yes, this the core of USEF: information is what drives the system	Information is provided on a need-to-know basis by a neutral, entrusted entity
Transparency (Art 25.5)	Yes, USEF emphasises that the system should be transparent	Not generally addressed by CREG; only mentioned with regard to the choice of the baseline for calculation of the compensation of FSPs and the correction of a BRP's perimeter
Objectivity (Art 25.6)	Not necessarily guaranteed– depends on the role of the DSO (neutral market facilitator or carrying out commercial services);	DSO are referred to as "non-market players" and well suited as neutral data managers
Rules and tariffs are cost-reflective (Art 25.6 and Art 37.6)	In USEF, it is the market that decides, and in this sense, tariffs should be cost-reflective although not elaborated upon in USEF.	Not addressed by CREG; about tariffs it is only mentioned that a low consumption element negatively impacts demand participation
Preserving Confidentiality of commercially sensitive information (Art 27)	Yes – See USEF Privacy and Data Protection guidelines documents.	Confidentiality of the confidentiality of the smaller FSP's client list and the price of the supplied energy is preserved
Prioritising renewable energy (Art 25.4)	Yes, this is the whole purpose of USEF	Yes, this is the whole purpose of CREG's model; however, sales of flexibility stemming from renewable and non-renewable sources are treated equally
Consideration of demand-side management (Art 25 para 1 and 7)	Yes, this is the whole purpose of USEF	Yes, this is the whole purpose of CREG's model
III – EU Energy Efficiency Directive		
Accurate billing information (Art 10.1)	Implicitly the idea but not elaborated on explicitly in USEF	Not addressed but implied/assumed; CREG does include a requirement of single billing for prosumers

	USEF	CREG
Priority to high efficiency co-generation (Art 15.5)	Not addressed by USEF	Not addressed by CREG
Cooperation with demand-response providers, aggregators (Art 16.8)	Yes, this is the whole purpose of USEF	Yes, this is the whole purpose of CREG's model; CREG expressly mentions the EU Energy Directive as one of the reasons for designing its framework
Prohibition to impede energy services (Art 18.3)	Not elaborated on in USEF/unknown	Yes, this is the whole purpose of CREG's model; the tool is the systematic compensation mechanism
Informing on energy efficiency measures (Annex VII)	Not elaborated on in USEF but presumed to be the case	Not addressed by CREG; may be presumed
Publicising rules on costs and adaptations (Annex XII)	Not elaborated on in USEF but presumed to be the case	Not addressed by CREG; may be presumed
Providing information to new producers wishing to be connected to the grid (Annex XII)	Not elaborated on in USEF but presumed to be the case	Not addressed by CREG; may be presumed
Standardised and simple procedures (Annex XII)	Not elaborated on in USEF	DSOs and TSOs should work on insuring interoperability of equipment and coordinate the billing of network costs and taxes
IV - Public Service, Customer and Consumer Protection Obligations (Electricity Directive)		
Competitive (Art 3.1)	Private sector model; assumed to be competitive	Regulatory model designed to promote competition for demand-side flexibility
Secure (Art 3.1)	Compliant with data protection; aimed at increasing security of supply through the system	Allows technical measures to protect grid security but attaches penalties and compensation payments to them
Environmentally sustainable (Art 3.1)	Yes	Yes with one caveat: CREG focuses on flexibility trade without distinguishing between sales of energy from renewable and non-renewable sources
Consumer right to be supplied	Not elaborated on in USEF	Not addressed by CREG but

	USEF	CREG
(Art 3.3)		implied/assumed
Consumer right to be connected (Art 3.3)	Not elaborated on in USEF	Yes; customer's right to access the network is mentioned
Consumer right to be informed (Annex I; Art 3.9 and 3.12)	Not elaborated on in USEF, but presumed	Not addressed by CREG but implied/assumed
Protection of vulnerable customers (Art 3.7)	Not elaborated on in USEF	Not addressed by CREG

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