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*Radical innovation in the energy sector and the impact on regulation**

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Abstract

The electricity sector is in a transition towards a Smart Energy System where the roles of private and institutional actors are evolving. This work deals with the influence of some technological innovations on the regulation of the energy sector. It identifies the main radical innovations in the energy market and analyses the legal and related non-legal obstacles that may impede the empowerment of energy consumers. Some recommendations are provided to ensure that consumers are empowered and can benefit from these new technological innovations. The recommendations relate to an accurate definition of prosumers and active consumers, the integration of demand response, the evolving role of distribution network operators and the birth of peer-to-peer trading.

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1. Introduction

1. The electricity sector is in transition towards a Smart Energy System. This transition implies some radical changes of the market design of the energy sector, affecting the basic assumptions of the current regulatory framework in the EU and its Member States. Among these new developments,¹ first, a move from centrally generated energy from fossil fuels to energy generated (locally) from renewable sources which are more volatile and intermittent should be mentioned. Secondly, energy consumers are also becoming more active as they are able to produce energy themselves, for instance by installing solar panels, and supplying it to the energy network becoming *prosumers*.² Thirdly, the traditional demand-driven system will be substituted by a supply-driven system supported by the introduction of demand response (DR) programmes³ and the storage of electricity by means of storage facilities connected to the distribution grid.

2. Thus the electricity system is developing towards a Smart Energy System where the roles of the private and institutional actors operating on the distribution and retail markets are evolving and modifying. The objective of the regulation must be to not distort innovations and to facilitate the integration of new environmental-friendly and smart technologies, such as distributed generation, smart meters, blockchain technologies, storage facilities and electric vehicles into the energy system. The integration of these new technologies in the energy system facilitates the development of a more decentralised energy system with new players where traditional utilities may lose relevance and peer-to-peer (P2P) electricity transactions become a reality. As will be discussed below, in this scenario, private law and competition law may acquire more importance under yet necessary safeguards of the remaining regulation to ensure, *inter alia*, the security of supply, the viability of the public network, protection of vulnerable consumers and non-discrimination regarding access to the energy network.⁴

3. In this new context, Juncker's Commission has enshrined the Energy Union as one of the priorities for his mandate.⁵ Consequently, DG ENERGY is particularly active

¹ See ECORYS, 'The Role of DSOs in a Smart Grid Environment' (DG ENER 2014). pp 23.

² Y. Parag and B. Sovacool, 'Electricity Market Design for the Prosumer Era' (2016) 1 Nature Energy. pp 1.

³ Demand response (DR) can be implicit or explicit. Implicit DR means that consumers change their consumption patterns voluntarily in response to market signals calculated with dynamic pricing that reflects the real-time price for the electricity. The idea is that consumers could change their consumption patterns avoiding times of high prices. This would reduce peaks of demand which generates benefits for the whole system. The reward for consumers is direct since they pay less for their electricity bills. On the other hand, explicit DR means that consumers organized and helped by aggregators receive a specific reward for their flexibility and willingness to change their demand for electricity at a given point in time. Demand response is already operating in Europe, however its implementation in the household sector is still limited. See Eurelectric, 'Dynamic Pricing in electricity supply' (2017) <http://www.eurelectric.org/media/309103/dynamic_pricing_in_electricity_supply-2017-2520-0003-01-e.pdf> accessed 30 April 2017 and ACER/CEER, 'Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2015: Retail Markets' (2016) <http://www.acer.europa.eu/official_%20electricity%20and%20gas%20retail%20markets.pdf> accessed 30 April 2017.

⁴ S.A.C.M. Lavrijssen, 'The right to participation for consumers in the energy transition', (2016) 25(5) European Energy and Environmental Law Review. pp. 152-171.

⁵ The objectives of the Energy Union are the diversification of sources of energy to grant security of supply, an internal energy market, energy efficiency, the decarbonisation of the economy and the support of

in preparing the modification of the current European regulatory framework of the energy sector. The last proposed amendments constitute the Winter package “Clean energy for all Europeans”⁶. Its three main goals are putting energy efficiency first, achieving a global leadership in renewable energies and providing a fair deal for consumers⁷. The promotion of innovation is a leading thought behind the Winter package since the proposal seeks to “accelerate clean energy innovation” and “create jobs and growth in new economic sectors and business models”⁸.

4. The European Commission thus observes the need for a recast of the current EU and national legislation. The existing framework is still based on the predominant generation technologies of the last decade, that is, centralised large-scale fossil fuel-based power plants and limited participation of (households and business) consumers in the energy system.⁹ Consumers are still viewed as passive agents which undermines their capacity of producing and selling their own energy.¹⁰ Moreover, the role that distribution system operators (DSOs) will play in the development of new activities is not sufficiently clear,¹¹ digitalisation and internet-based metering and trading innovations are forgotten disruptions which, however, will facilitate DR solutions.¹² These innovations shall also have an impact on new forms of (dynamic) contracts, the way that retailers operate and interact with business and households consumers. Household consumers will be empowered and will have access to new options, such as aggregators operating as retailers or P2P digital platforms. However, current regulation does not (yet) sufficiently accommodate or may even impede these new innovations.¹³ A regulatory disconnection¹⁴ exists, that is, an actual discrepancy between technological developments and the assumptions of the existing regulatory framework, which require a regulatory response to restore the disconnection.

research and innovation. See Commission, ‘Communication from the Commission: Second Report on the State of the Energy Union’ COM (2017) 53 final.

⁶ Accessible here <<http://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition>>

⁷ Commission, ‘Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European investment bank, ‘A clean energy for all Europeans’ COM (2016) 860 final. pp 3

⁸ See Commission, ‘Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European investment bank, Accelerating Clean Energy Innovation’ COM (2016) 763 final.

⁹ Commission, ‘Proposal for a Regulation of the European Parliament and of the Council on the internal market for electricity’ (Proposal for a revised electricity Regulation) COM (2016) 861 final/2. Explanatory Memorandum.

¹⁰ S.A.C.M. Lavrijssen ‘Power to the Energy Consumers’ (2017) TILEC Discussion Paper. <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2956342>

¹¹ CERRE, ‘The Changing World of the DSO in a Smart Energy System Environment: Key Issues and Policy Recommendations.’ (CERRE 2016).

¹² Proposal for a revised electricity Regulation (n 9) supra. Explanatory Memorandum.

¹³ See Section 3.

¹⁴ Anna Butenko, ‘Sharing Energy: Dealing with Regulatory Disconnection in Dutch Energy Law’ (2016) 4 EJRR, pp. 701-716.

5. In this scenario, this work tries to deal with the influence of the abovementioned innovations on some aspects of the regulation of the energy sector. It detects the main legal obstacles for consumers to become empowered to integrate in the energy markets in the short and long term by benefitting from new services and by participating in the energy markets in new ways. The work, particularly, focusses on the ability of household consumers to become active consumers, including prosumers who are able to both consume and produce energy.¹⁵ For that, the work also deals with the role of DSOs, consumer protection provisions and the regulation of the retail market. The objective is to provide some regulatory recommendations for the introduction and integration of these (active) consumers and the related new technological developments and innovations in the electricity sector.

6. Accordingly, this work will provide an overview of the main radical innovations in section 2. Section 3 will firstly describe the legal obstacles that (active) consumers who make use of these new innovations face. The contribution will also refer to technical and psychological obstacles that need to be considered by policy-makers, as they may impede new innovations and regulatory solutions. The empowerment of active consumers may culminate in a future where peer-to-peer trading may become a reality. This section also deals with obstacles that prosumers and active consumers could encounter in this future scenario.

7. Once the obstacles have been detected, Section 4 will provide solutions and recommendations for the regulation of the new market design. Moreover, this section will build on the prospective future to observe and reflect how the tendency of the regulation could be. Section 5 sums up the main conclusions.

8. The methodology of this paper consists of a literature review of the main innovations that will impact the electricity market in the next years. By way of a legal analysis, it will also assess the current and proposed regulation to evaluate whether it is ready or not to face the new challenges that the transition to a smart energy system will place on the energy system. The work will also adopt a normative approach to give some recommendations for future regulation.

2. Technological developments and radical innovations.

9. The EU Commission considers that the energy system has reached a “tipping point”.¹⁶ Competitiveness of renewable sources soared and its share of electricity generation has increased.¹⁷ The energy transition will lead to a more decentralised system where the paradigm of dominance of large companies, passive consumers and large-scale generation by coal and gas-fired plants disappears. It is therefore necessary to identify the technological innovations and market developments that are pushing the energy transition since this new market design will affect the way in which private and public actors relate to consumers in electricity markets.

¹⁵ See S. A. C. M. Lavrijssen, ‘The Different Faces of the Energy Consumers: Towards a Behavioral Economics Approach’, (2014) 10(2) *Journal of Competition Law and Economics*. pp. 257-279. See also Section 3.1 *infra*.

¹⁶ Commission, (n 8) *supra*.

¹⁷ Morgan Bazilian and others, ‘Re-Considering the Economics of Photovoltaic Power’ (2013) 53 *Renewable Energy*. See also Commission, (n 8) *supra*.

10. The first evidence of the energy transition is reflected in the increasing number of prosumers.¹⁸ The decreasing costs of solar photovoltaic generation,¹⁹ storage technologies and the increasing number of electric vehicles²⁰ is leading towards a new system in which consumers produce, use, store and sell their energy.²¹ Distributed generation increases energy efficiency since electricity lost in the grid is reduced because the location of the generation facilities and the location of energy consumption are closer. Nonetheless, the growth of distributed generation is also connected to increasing costs for the network, mostly due to increased network tariffs and taxes (financing the production of renewable energy), which translates into a raising of consumers' electricity bills.²² Furthermore, the increasing number of solar PV feeding energy into the grid and the increasing number of electric vehicle charging units demanding electricity during peak times complicate the control and operation schemes of the DSOs, as there may be more local imbalances and local congestions that need to be solved.²³ DSOs will have to upgrade their grids by adding new ICT layers, enabling them to transport bi-directional power flows and to balance demand and the more volatile supply in an optimal way.²⁴ In short, they have to ensure that their distribution grids are becoming smart grids.²⁵

11. Secondly, the European Commission predicts that close to 200 million smart meters for electricity will be rolled out in the EU by 2020.²⁶ The deployment of smart meters facilitates the integration of small prosumers to the grid and the development of DR. Smart meters provide real-time information on cost and usage which are expected to

¹⁸ In 2015 there were around 4.8 million EU household prosumers and 620 thousand collectives according to CE Delft, 'The potential of Energy citizens in the EU' (2016) <<http://www.cedelft.eu/publicatie/the-potential-of-energy-citizens-in-the-european-union/1845>> accessed 18 April 2017. They also estimate that 83% of EU households will become prosumers by 2050.

¹⁹ In the EU, generation of energy using solar PV in 2015 is thirteen times higher than in 2008 (Eurostat data).

²⁰ Martino Tran and others, 'Realizing the Electric-Vehicle Revolution' (2012) 2 Nature Climate Change.

²¹ Parag (n 2) supra.

²² Simone Pront-van Bommel, 'A Reasonable Price for Electricity' (2016) 39 Journal of Consumer Policy. The average network component in consumer bills has increased by 25% since 2008. Electricity price has increased from 0.14 in 2006 to 0.21 in 2016 (Eurostat)

²³ Green Alliance, 'People power: How consumer choice is changing the UK energy system' (2017) <http://www.green-alliance.org.uk/resources/People_power_how_consumer_choice_is_changing_UK_energy_system.pdf> accessed 30 April 2017. pp. 2 points out that six electric vehicles charging near one another could lead to brownouts. Charging one electric car amounts to a three days household consumption.

²⁴ Parag (n 2) supra. pp.4.

²⁵ The term smart grid refers to a cluster of innovations in metering and communications which allow for more distributed and small-scale generation, more efficient customer consumption decisions, and more efficient and higher utilisation of network resources. See OECD, 'Policy Roundtables: Renewables and Smart Grids' (2010) <<http://www.oecd.org/daf/competition/sectors/46586020.pdf>> accessed 10 April 2017.

²⁶ Commission, 'Report from the Commission: Benchmarking smart metering deployment in the EU-27 with a focus on electricity and Commission' COM (2014) 0356 final and Commission, 'Evaluation Report accompanying the document Proposal for a Directive of the European Parliament and of the Council on common rules for the internal market in electricity (recast)' SWD (2016) 410 final. It will require an investment of €45 billion. 72% of European consumers will have a smart meter for electricity. Nonetheless, some countries still do not deploy smart meters.

encourage consumers to reduce their demand and switch their consumption patterns to off-peak hours. As will be explained below, they are also essential for the implementation of other innovations such as storage facilities and P2P networks.

12. In the third place, new possibilities for home storage solutions, distributed generation, smart-vehicle battery-charging strategies and home automation technologies enable consumers to optimize their electricity use and match it with their consumption needs.²⁷ These active consumers can deliver flexibility services to the markets, by using less in times of an overload of the system and by using more when there is ample energy and network capacity. This flexibility also results in a more optimal use of distribution networks. The idea is that it takes away the need of DSOs to enlarge the network capacity to such extent that all possible (maximum) demand and load peaks can be dealt with, keeping the network tariffs more affordable as well.²⁸

13. Fourthly, digitalization will also play a key role by lowering barriers to entry for allowing consumers, local communities and small start-ups to lead the development of energy innovations, for instance by trading energy on P2P digital platforms and by the participation in DR with the option of remote control of energy use.²⁹ The combination of blockchain technology together with the rapid growth of decentralised energy supply bears a considerable disruptive potential for the retail markets and make P2P trading a tangible possibility. Blockchain technology may detach financial transactions and the execution of contractual commitments from a central control unit which, constitutes a threat for the business of traditional utilities.³⁰ Thus a next disruption is expected to involve digital platforms, which could make use of blockchain technologies, in which consumers could trade P2P.³¹

14. In the fifth place, although it is not a technological innovation in the strict sense, the role of some relevant actors of the electricity market must evolve and adapt to the new circumstances. After the unbundling requirements that the Third Package mandated for DSOs, a new development of their tasks and functions is required. As it will be explained below,³² they ought to become more active managers in order to integrate flexibility services and prosumers, contributing to the new market design in their roles as neutral market facilitators.

²⁷ Parag (n 2) supra.

²⁸ See CERRE (n 7) pp 25.

²⁹ Commission, (n 8) supra. See also Tabors Caramanis Rudkevich (TCR) ‘White Paper on Developing Competitive Electricity Markets and Pricing Structures’ (NYSERDA 2016)

³⁰ Dena, ‘Blockchain in the energy transition: A survey among decision-makers in the German energy industry’ (2016) <
https://www.dena.de/fileadmin/dena/Dokumente/Meldungen/dena_ESMT_Studie_blockchain_englisch.pdf> accessed 10 April 2017.

³¹ PwC, ‘Blockchain – an opportunity for energy producers and consumers?’ (2016) <
https://www.pwc.fr/fr/assets/files/pdf/2016/12/blockchain_opportunity_for_energy_producers_and_consumers.pdf> accessed 10 April 2017.

³² See Section 3.1.2 infra.

3. Towards a new market design: obstacles for prosumers' integration

Nonetheless, the introduction of these technologies and innovations also raises a number of issues regarding the regulation of the energy market. This section will focus on the legal and some non-legal obstacles that prosumers face when integrating in the new smart and decentralised electricity system to see how EU and national policy makers could deal with them

3.1. Legal barriers for the integration of prosumers and active consumers

3.1.1. The concept of prosumers

15. As discussed above, prosumers are consumers which not only withdraw energy from the network, but also produce and supply energy into it.³³ Even if they must, generally, be considered as consumers, prosumers participating in energy efficiency and especially demand response programmes are often behaving more like producers than consumers since they provide services that the market needs in exchange for compensation.³⁴ The definition of prosumers often describes consumers or other agents that rely on smart meters and solar PV panels to generate electricity and/or combine these with home energy management systems, energy storage, electric vehicles and electric vehicle-to grid (V2G) systems.³⁵

16. Nonetheless, a first legal barrier that they encounter is that most of national regulatory frameworks in the EU does not define who fall within the concept of prosumer yet. The consequence is that their rights and obligations have not been defined and diverge between Member States. The Winter package provides a definition at the EU level for first time. Nonetheless, in spite of the reception that this term has in the literature on energy law and economics, the Winter Package prefers to use the term *active customer*.³⁶ It clarifies that the abovementioned commercial activities cannot constitute the “*primary commercial or professional activity*” of the consumer. This casts some doubts on the ability of active consumers to place competitive pressure on energy suppliers,³⁷ which seems to be one of the objectives of the Winter Package.³⁸

17. Prosumers, unlike traditional consumers, are more autonomous and participate in a more active and diverse way in the market.³⁹ Prosumers take more control of their

³³ Lavrijssen, (n 10) supra.

³⁴ Sharon B. Jacobs, 'The Energy Prosumer' (2017) 43 Ecology Law Quarterly.

³⁵ Parag (n 2) supra.

³⁶ According to Commission, 'Proposal for a directive of the European parliament and of the Council on common rules for the internal market in electricity' COM (2016) 864 final (Proposal for the amendment of the electricity Directive) Article 2(6): “a customer or a group of jointly acting customers who consume, store or sell electricity generated on their premises, including through aggregators, or participate in demand response or energy efficiency schemes provided that these activities do not constitute their primary commercial or professional activity”.

³⁷ Cosmo Graham, 'New Challenges in Energy Efficiency in the European Union: A Consumer' Perspective' [2017] University of Leicester School of Law Research Paper No. 17-02. < https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2967486 > accessed 22 May 2017

³⁸ See *inter alia* Proposal for the amendment of the electricity directive, (n 36) supra. Art. 5.

³⁹ Jacobs, (n 34) supra.

consumption decisions, either taking active steps to regulate their consumption or engaging in self-supply. Moreover, they act as market participants by selling the excess of energy generated to their local utilities, by bidding energy storage services into ancillary services markets, and by receiving compensation through demand response programs.⁴⁰ Regulation is then expecting that prosumers become an active and relevant actor in the market.

18. Demand response programmes provides a way to integrate prosumers and household consumers in the electricity markets as active participants. However, there are still some legal and technical problems to allow a massive participation of small prosumers in demand response programmes through dynamic retail pricing (Implicit DR) and the use of aggregators (Explicit DR) which will be explained below.

3.1.2. Legal barriers for the introduction of Demand Response (DR).

19. With regard to implicit demand response, dynamic retail pricing means the calculation of the energy costs based on real time pricing. It reflects the marginal network costs and/or generation costs of energy in the wholesale market.⁴¹ Currently, there is significant variation in the penetration of dynamic pricing among households in Europe. So far dynamic pricing for residential consumers only exists in the Nordic, Estonian and Spanish electricity markets.⁴²

20. There are several reasons that still impede the penetration of dynamic pricing.⁴³ First, the influence of non-energy components could provide wrong signals that can blur the benefits of dynamic pricing, unless they are also dynamically designed.⁴⁴ There is not a prohibition in the regulatory framework that prevent dynamic network tariffs, however they are still not being applied.⁴⁵ The reason may be that they are complex, as well as dynamic pricing is not a panacea since it can also have socially adverse redistribution effects, for instance for vulnerable consumers with less flexible consumption patterns or less access to flexibility sources.⁴⁶ In addition, the creation of more individualized data

⁴⁰ Ibid

⁴¹ Dynamic pricing has many applications according to the time reference for consumption metering and the dynamic nature of Time-of-Use Tariff (ToU). See on this: S. Borenstein, M. Jaske and A. Rosenfeld, Arthur 'Dynamic Pricing, Advanced Metering, and Demand Response in Electricity Markets' (2002). Center for the Study of Energy Markets. UC Berkeley, A. Faruqui and S. Sergici, 'Arcturus: International Evidence on Dynamic Pricing' (2013) 26 *The Electricity Journal*.

⁴² See Eurelectric (n 3) supra

⁴³ This section builds on Eurelectric (n 3) supra and ACER/CEER, (n 3) supra.

⁴⁴ See Eurelectric (n 3) supra. The 'energy component' represents only one third of the average EU retail consumers' bill. The remaining 2/3 of the bill are regulated charges, including network costs, taxes and levies. The energy component even decreased from 41% to 37% of the final electricity bill over 2012-2015. Charges relating to support renewable energy sources (RES) increased from 6% to 13%. Data from ACER/CEER (n 3) supra.

⁴⁵ See Ecorys (n 1) supra. pp 100.

⁴⁶ See on this: Pront van-Bommel (n 22) supra and S. Neuteleers, M. Mulder and F. Hindriks 'Assessing Fairness of Dynamic Grid Tariffs' (2016) 16014 SOM Research Reports University of Groningen. They also point out that if a good becomes scarce, for instance, because of exceptional weather conditions, people in general conceive pricing as an unfair way to deal with the excess of demand.

by smart meters raises questions about their treatment.⁴⁷ This could create potential problems with the right to data privacy, if unmanaged.⁴⁸

21. Regarding explicit demand response, the number of prosumers has increased together with the number of aggregators.⁴⁹ These companies offer their services as middlemen between prosumers and energy markets,⁵⁰ for instance they aggregate many small demand response commitments and bid them as a package into retail or wholesale electricity markets. Aggregators capitalise on economies of scale and scope and the savings that they get are passed on their clients retaining a fee.⁵¹ The aggregator can act as an incumbent energy supplier offering aggregation services, a service provider specialized in aggregation services collaborating with a supplier, a joint venture between a traditional supplier and a service provider or as an independent market actor (independent aggregator).⁵² In addition, regulation can permit opt-in models where the consumers choose to join the services provided by an aggregator or opt-out models where the consumer belongs to the aggregation scheme unless he expresses he does not want.⁵³ It is a regulatory decision to make the abovementioned business models available for consumers.⁵⁴ The value of aggregators in the retail market is that they offer a service to

⁴⁷ Colette Cuijpers and Bert-Jaap Koops, 'Smart Metering and Privacy in Europe: Lessons from the Dutch Case', *European Data Protection: Coming of Age* (1st edn, Springer 2012).

⁴⁸ CERRE, 'Empowering electricity consumers in retail and wholesale markets' (2017) <http://www.cerre.eu/sites/cerre/files/170309_CERRE_EnergyConsumers_Final.pdf> accessed 30 April 2017 warns that "thanks to smart meters and demand-response programs, large quantities of precise information will be collected [...] Consumers will progressively lose the initial informational advantage on their electricity needs [...] and service suppliers will be able to extract more rents from consumers.[...] Another question(s) are [...] Will it be legal to sell data on consumption profiles? Will data on profiles be viewed as an essential facility for new entrants?"

⁴⁹ Proposal for the amendment of the electricity directive, (n 36) supra. Article 2(14) defines aggregators as a market participant that combines multiple customer loads or generated electricity for sale, for purchase or auction in any organised energy market.

⁵⁰ Jacobs, (n 34) supra.

⁵¹ MIT CEEPR, 'The Value of Aggregators in Electricity Systems' (2016) CEEPR WP 2016-001 <https://energy.mit.edu/wp-content/uploads/2016/01/CEEPR_WP_2016-001.pdf > accessed 10 April 2017.

⁵² See BestRES, 'Existing business models for renewable energy aggregators' (2016) <http://bestres.eu/wp-content/uploads/2016/08/BestRES_Existing-business-models-for-RE-aggregators.pdf> for a more profound analysis of the existing business models in Europe.

⁵³ Opt-out models have been developed at a local level in US. See for a review of the experiences, T. Deryugina, A MacKay and Julian Reif 'The Long(er)-Run Elasticity of Electricity Demand: Evidence from Municipal Electric Aggregation' (2017) <<https://ei.haas.berkeley.edu/events/docs/T.%20Deryugina.pdf> > accessed 4 May 2017 and S. Littlechild, 'Municipal Aggregation and Retail Competition in the Ohio Energy Sector' (2008) 34 *Journal of Regulatory Economics*.

⁵⁴ To see which European countries are allowing explicit demand response and how, see SEDC, 'Explicit Demand Response in Europe: Mapping the Markets 2017' (2017) <<http://www.smartenergydemand.eu/wpcontent/uploads/2017/04/SEDC-Explicit-Demand-Response-in-Europe-Mapping-the-Markets-2017.pdf>, OFGEM, 'Aggregators: Barriers and External Impacts' (2016) <https://www.ofgem.gov.uk/system/files/docs/2016/07/aggregators_barriers_and_external_impacts_a_report_by_pa_consulting_0.pdf > accessed 10 April 2017. See also J. Ikaheimo, C. Evans and S. Kärkkäinen 'DER Aggregator Business: the Finnish case' (2010)

consumers that do not have the means and knowledge to trade in the market. However, explicit DR still encounters some regulatory obstacles in Europe.⁵⁵ First, in some markets demand-side resources cannot access the market since they are closed to explicit demand response.⁵⁶ Moreover, some markets have not opened their markets to aggregated load, only allowing industrial customers to access the market.⁵⁷ In addition, some countries have still neither defined what an independent aggregator is, nor clarified its role under a principle of fair competition that let them access to the market without an agreement with the consumers' retailer.⁵⁸

3.1.3. Evolving roles of DSOs

22. In this new market design, where consumers become more active, DSOs are one of the key contract partners of the prosumers and active consumers. The DSO's key task⁵⁹ is the responsibility to ensure the long-term ability of the distribution system, as well as to manage a secure, reliable and efficient electricity distribution system.⁶⁰ Furthermore, DSOs usually are also responsible for measuring the energy used and produced by household consumers and usually make measurement devices available for small connections.⁶¹ Prosumers and distributed generation together with the roll-out of smart meters ought to change the role of DSOs vis-à-vis the consumers to a more active system manager.⁶² Nonetheless, this should not change core responsibilities of DSOs (e.g. maintaining grid security and ensuring security of supply).

23. There is also wide consensus among policy-makers that DSOs are well suited to act as neutral market facilitators in the transition towards a Smart Energy System.⁶³ This

<http://www.ece.hut.fi/enete/DER_Aggregator_Business_Finnish_Case.pdf> pp 23 for the advantages and disadvantages between a retailer model and service-to-the-retailer model.

⁵⁵ See SEDC (n 54) supra.

⁵⁶ Ibid. It is the case of the balancing markets in Spain or Italy as well as the re-dispatching market in Germany. In the Netherlands, aggregators can only participate in the market through balancing responsible parties (BRPs).

⁵⁷ Polonia and Slovenia.

⁵⁸ SEDC (n 54) supra finds out that 80% of demand side volumes in US are provided through independent aggregators, even though suppliers are able to offer the same service. Independent aggregators are third party intermediaries. Thus they differentiate from other market parties, such as retailers, that could

⁵⁹ Directive 2009/72/EC of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC [2009] OJ 2 211/29 (Electricity Directive) Article 25 Tasks of the DSO.

⁶⁰ See CERRE (n 11) supra.

⁶¹ Ibid

⁶² EvolvDSO, 'Development of methodologies and tools for new and evolving DSO roles for efficient DRES integration in distribution networks' (2014) D 1.3. pp 29. From a perspective where the DSO is limited to adapt its network to respond to demand, it is expected that DSOs will be able to contract flexibility resources and will become data managers. They will also potentially administer the smart metering infrastructure and manage prosumer's connection to the grid.

⁶³ CEER, 'The Future of the Role of DSOs, A CEER Conclusions Paper', (2015) <http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Cross-Sectoral/Tab1/C15-DSO-16-03_DSO%20Conclusions_13%20July%202015.pdf> accessed 22 March 2017. pp 36.

notion expresses the idea that the DSOs can enable and facilitate the connection of flexibility services⁶⁴ to their grids to develop local flexibility markets in a neutral way, for instance by sharing data on the availability of flexibility sources in an independent way. The evolving DSOs' tasks related to the role of neutral market facilitator are not addressed by the current legislative frameworks.⁶⁵

24. Moreover, as it is expected that more imbalances and congestions may occur locally, DSOs may also assume part of the transmission system operators (TSOs)' main task which is the balance of demand and supply. Accordingly, DSOs could locally balance demand and supply and apply local congestion management in the distribution systems.⁶⁶ This development requires more coordination and cooperation between the DSOs and TSOs.

3.1.4. Legal barriers for the birth of Peer-to-peer (P2P) networks.

25. In a decentralised electricity market where active consumers and prosumers are progressively being empowered, the technological process seems to head towards a paradigm where these consumers could buy and sell energy among themselves. In April 2016, the project *Transactive Grid* did the first P2P exchange of energy between five homes in Brooklyn, NY. The excess of energy produced on one part of the street was sold to the other part without the need of a utility.⁶⁷ The emergence of blockchain technology⁶⁸ and the raising of prosumers with storing mechanisms facilitate the booming of P2P markets where prosumers, and consumers, could buy and sell energy between each other without an intermediary.⁶⁹ Even if it is possible to conceive a future with a majority of autonomous off-grid and self-sufficient agents, it is more likely that prosumers are still connected to a (micro)grid where they sell their excess of energy.⁷⁰

⁶⁴ Flexibility can be seen as the modification of generation, injection and/or consumption patterns in reaction to an external signal in order to provide a service within the power system. See CERRE, (n 11) supra. pp. 17.

⁶⁵ CEER (n 63) supra. pp 18.

⁶⁶ Ibid.

⁶⁷ *Transactive Grid* helped to manage the microgrid that supported the transaction and used a blockchain software run by *Ethereum* project. After this first pilot, the US start-up *LO3*, responsible of the *Transactive Grid* project, is collaborating with *Siemens* to develop blockchain microgrids. See Siemens Press Release 21 Nov 2016 <<https://www.siemens.com/press/PR2016110080EMEN>> accessed 24 May 2017.

⁶⁸ Blockchain is a decentralized internet protocol that facilitates transactions, such as the sale of electricity, directly between peers without an intermediate institution. In the energy sector, decentralised storage of transaction data could increase security and may ensure greater independence from a central authority. It can also help to digitize contracts, to manage digital content and to execute trades. Nonetheless, unlike the financial sector, where blockchain is firstly being developed, electricity requires a network infrastructure to be transported. See Dan Tapscott and Alex Tapscott, *Blockchain Revolution* (1st edn, Portfolio Penguin 2016) and PwC (n 31) supra.

⁶⁹ Parag, (n 2) supra.

⁷⁰ Rajab Khalilpour and Anthony Vassallo, 'Leaving the Grid: An Ambition or a Real Choice?' (2015) 82 Energy Policy.

26. Parag et al envisages three possible models of prosumer-integrated markets.⁷¹ P2P models *strictu sensu* interconnects prosumers directly with each other wherever they are. These models are the less structured ones. A P2P platform would allow prosumers to bid and sell energy directly between each other. Secondly, prosumer-to-grid models connect prosumers to a local microgrid where they buy and sell their services. There would be brokerage systems where prosumers would sell the electricity to a central (local) market where other prosumers and consumers would buy it. Thirdly, in organized prosumer group models, group of prosumers aggregate their resources in pools and buy and sell to other prosumer groups. This model is more structured and centralized than the other two. Accordingly, the first model requires a larger number of contractual relations and the development of its network is more costly. More decentralisation also entails a more uncertain attribution of liability and accountability for the energy services. Those problems are less relevant in the other two models where the use and demand of energy is more aggregated. Nevertheless in the last two models, prosumers mainly provide a service to the grid, rather than becoming a competitor for generation.⁷²

27. Even if P2P electricity trading is still in an embryonic state, it allows to conceive a future where the energy could be sold for a trading period (30 minutes or 1 hour) between consumers/prosumers without the intervention of a traditional utility. This raises some legal questions on how the energy market could be and how the new roles, responsibilities and rights of market participants evolve.

28. The first question that P2P networks raises is whether the prosumer that sells the excess of energy to another peer is a business or still a consumer. With the possibilities to store energy and to speculate with the price of electricity through storing capacities, the prosumer that sells the excess of energy that it does not use might be more similar to a business.⁷³ If they were considered businesses, they would have to comply, *inter alia*, with stricter consumer provisions when they sell the energy or with a different tax regime. This could also result in prosumers becoming balance group managers and submitting their own demand forecasts to the network operator.⁷⁴ This would place an unjustifiable burden on the prosumers that would likely prevent the rise of P2P trading.

29. A second issue is that it is possible to conceive some self-sufficient microgrids, albeit it is more likely that they are still connected to a macrogrid to ensure the security of supply.⁷⁵ A “manager” should demand energy to the macrogrid to grant the supply in the microgrid when the latter is exhausted due to the intermittent flows of renewable

⁷¹ See Parag, (n 2) supra. Some of these models are already being tested. For instance, Piclo pilot programme (UK) is an online market for renewable energy for local commercial consumers. Vandebroon (Netherlands) has launched a platform that enables individuals to buy green electricity directly from a local farmer.

⁷² Parag (n 2) supra.

⁷³ This question is being discussed in the context of the shared economy and collaborative consumption. See in detail FTC ‘The “Sharing” Economy: Issues Facing Platforms, Participants & Regulators’ <https://www.ftc.gov/system/files/documents/reports/sharing-economy-issues-facing-platforms-participants-regulators-federal-trade-commissionstaff/p151200_ftc_staff_report_on_the_sharing_economy.pdf.> In the EU, ECJ will have to solve a preliminary reference made by a Spanish Court (C-434/15 - *Asociación Profesional Elite Taxi*) which could solve some of the questions about the sharing economy.

⁷⁴ PwC (n 31) supra.

⁷⁵ Among the prosumer networks proposed by Parag, (n 2) supra, the organized consumer groups may be the more likely in the near future. It is the less decentralized, but the one that better ensures the supply.

generation. Regulation ought to designate who should be this microgrid manager. It would not be strange to give that function to the DSO.

30. A third question concerns the elimination of intermediaries. Even if blockchain technology could help to eliminate the retailer in some transactions, others may appear, such as the digital platform that keep peers in contact. Moreover, every private transaction between peers would have to be levied for the use of the DSO's infrastructure.⁷⁶ Blockchain technology could help as the ledger for all those transactions.

31. The introduction of these new digital platforms in the market raises some concerns as well. They may be a retail market platform or central backbone which will make profit of interconnecting sellers and buyers of energy (in exchange for a fee per transaction of per kW) such as Uber or Airbnb do in other sectors. Nonetheless, the transaction that peers negotiated through the platform would be different and add to the transaction that the peers make with the DSO to transport the electricity fed into the grid to the demand point. Thus the role of the peer-to-peer platform at least in a first stage could be more to complement than substitute the incumbents, which will still participate in the market and ensure the non-P2P transactions.⁷⁷ Nonetheless, the introduction of new business models would inevitably reduce the gains of some incumbents, such as traditional suppliers, unless they are the ones that operate the new platforms. This could lead to a "death spiral" of current utilities when new businesses thrive.⁷⁸ It could also create unfair competition problems for P2P platforms in the energy sector, as Uber is experiencing in the transport sector, due to the considerable market power that some traditional suppliers still have in some countries.

32. An important question to answer is thus the legal nature of these digital platforms. Would the platforms and their members be subject to the same obligations as energy suppliers? Would they be considered an "information society service" that keep consumers in contact?⁷⁹ The consequence of being considered as an "information society service" would mean a different application of the freedom of services. In that case, licences and authorizations by Member States would be more difficult to justify.

⁷⁶ Stuart Ravens and Richard Shandross 'Understanding Peer-to-Peer, Blockchain, and Transactive Energy' (2017) Navigant Research Blog < <https://www.navigantresearch.com/blog/understanding-peer-to-peer-blockchain-and-transactive-energy> > proposes a model where DSOs receives a small fee for the use of its infrastructure. The supply company or aggregator earns a small fee for operating the blockchain-based platform that connects peers. Consumers still pay a retail tariff, including taxes and distribution charges. Prosumers are paid a price significantly above wholesale, but below retail prices.

⁷⁷ See L. Kiesling 'An Uber for Electricity: Institutional Theory and Practice for a Regulated Industry in a Technologically Dynamic Environment' (2016) < http://questromworld.bu.edu/platformstrategy/files/2016/06/platform2016_paper_18.pdf > Uber, for instance, has not eliminated the taxi business which still has competitive advantages, *inter alia*, between consumers which do not make use of digital platforms. BlaBlaCar also does not work well in some routes.

⁷⁸ Utilities lose sales due to the increasing number of prosumers that generate their own energy, utilities will try to recover lost revenues by increasing their rates to a fewer number of customers. The price increasing will aggravate the problem since yet more customers will leave the utility system to become prosumers. See Kenneth W. Costello and Ross C. Hemphill, 'Electric Utilities' 'Death Spiral': Hyperbole or Reality?' (2014) 27 The Electricity Journal. See also The Wall Street Journal, 'Lights Flicker for Utilities' (2013).

⁷⁹ See C-434/15 *Asociación Profesional Elite Taxi v Uber Systems Spain, SL* [2017] ECLI:EU:C:2017:364] Opinion of AG Szpunar, where he considers that Uber falls within the field of transport, rather than information society services, and therefore it can be subject to licenses and authorizations.

33. As a last remark, a second stage of booming of P2P transactions also suggests that the incredibly high number of transactions that would be generated between peers would have to be automatized. As in financial markets, the parties may have to define a trading strategy,⁸⁰ which may be set in computer code. The transactions would then be executed impartially by the computer matching buy and sell orders. Potentially, consumers could delegate their trading functions to professional managers that could manage their “electricity portfolio”, as investment funds in financial markets. This may require a market regulation similar to a stock exchange providing a framework contract for some microgrids which would take into account possible contingencies and would establish obligations of the parties involved. It is likely that those framework contracts have to be approved by a public authority to provide the rules that would guide the platforms and designate the manager that secure the balance of supply and demand.

3.2. Non-legal barriers for the integration of prosumers.

34. In addition to legal obstacles, there are also other technical and psychological obstacles for the integration of prosumers in the electricity markets. One important barrier is technical, and relates to the absence of metering equipment that allows to have access to real time user data to calculate the price of energy use. Smart meters equipped with some functionalities are an essential development to make, *inter alia*, dynamic pricing available to consumers. The current EU deployment will make dynamic pricing available for more consumers, although some countries have decided not to participate in the current EU roll-out.⁸¹ Although the confidence of European Commission in smart meters is high, academics have also raised some problems such as excess of information for consumers, the possibility of suppliers to discriminate between price-sensitive consumers or that consumers do not sufficiently react to information provided by smart meters⁸²

35. Moreover, consumers also face psychological and behavioural barriers. While it is certain that the abovementioned developments substantially impact the market design of the energy sector, it still remains uncertain to what extent and within which time limits these developments will be realized. The integration of new technologies in the energy system will to a large extent depend on the consumers’ acceptance of these technologies.⁸³ For instance, consumers’ lack information and awareness of the possible benefits of dynamic pricing is an important barrier to the introduction of demand response. Current market situation suggests that they might prefer stability in pricing over a financial reward for adjusting their consumption.⁸⁴ In addition, the benefits of demand response, such as dynamic retail pricing, depend on the characteristics of the market, such as the volatility of wholesale price. For example the shifting potential of Scandinavian

⁸⁰ For instance, more flexible consumers (more risk) may be able to make more profit selling energy.

⁸¹ Commission, (n 26) supra. For instance, Portugal or Czech Republic. The reasons are economic. They are required to assess the cost-effectiveness of a large-scale smart metering deployment on a regular basis.

⁸² See Graham (n 37) supra. pp. 6 and the literature cited thereof.

⁸³ Cass R. Sunstein and Richard H. Thaler, 'Libertarian Paternalism is not an Oxymoron' (2003) 70 The University of Chicago Law Review. pp. 1166 and Russell B. Korobkin and Thomas S. Ulen, 'Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics' (2000) 88 California Law Review.

⁸⁴ This may be suggested by the increasing presence and popularity of fixed contracts among household consumers in several European countries. ACER/CEER (n 3) supra. See also Lavrijssen (n 10) supra.

countries, where volatility of wholesale prices is higher, is not observed in other EU countries.⁸⁵ Thus while energy consumers are expected to actively participate in the energy market, by informing themselves about alternative energy (service) contracts and by consciously making choices about their energy contracts and energy use, empirical studies into consumer behaviour in the energy markets show otherwise.⁸⁶ Various academic research, as well as studies, conducted in the energy sector indicate that, when entering into energy supply contracts, consumers remain very often inactive or fail to make optimal choices in terms of price and quality of the energy supply contracts.⁸⁷ In addition to mal-functioning retail markets, this is partly the result of the psychological factors that influence consumers' behaviour, such as the status quo bias, loss aversion and bounded rationality.⁸⁸

3.3. Observations

36. In light of some of the problems discussed above, a crucial question, therefore, is whether the legislator can reasonably expect the energy consumer, who already experiences severe difficulties to properly assess the complex information concerning contracts in the market for traditional energy supply, to become more active and make well informed and optimal choices in a Smart Energy System. Even if some legal obstacles for the introduction of dynamic pricing and the use of aggregators are removed, prosumers still encounter psychological bias to become more active. In addition, in the new decentralised system, DSOs are increasing their relevance for the integration of active consumers in the market. A new configuration of their functions and responsibilities seems necessary to facilitate the introduction of new innovations and eventually let P2P networks appear. It is precisely the path towards P2P trading which could disrupt the electricity markets in the next years. Nonetheless, P2P trading is still in an embryonic state and has to respond several questions. How many consumers will become a prosumer engaged in P2P trading? Or how many consumers will actually go off-grid? In the electricity market, where incumbents' business models depend largely on

⁸⁵ Ibid. See on volatility of prices in Europe, Commission, 'Report from the Commission: Energy prices and costs in Europe' COM (2016) 769 final. pp 4.

⁸⁶ See for an overview of behavioural economics research into the energy consumers, Lavrijssen (n 15) supra, Michael G. Politt and I. Shaorshadze, 'The role of behavioral Economics in Energy and Climate Policy'(Cambridge University 2011), ECME Consortium, 'The Functioning of the Retail Electricity Markets for Consumers in the European Union' (DG Health and Consumers 2010) http://ec.europa.eu/consumers/archive/consumer_research/market_studies/docs/retail_electricity_full_study_en.pdf accessed 22 March 2017, OFGEM, 'What can Behavioural Economics Say about Energy Consumers?', (2011) <https://www.ofgem.gov.uk/ofgem-publications/75192/behavioural_economics/benenergy.pdf > accessed 22 March 2017, Oxera, 'Behavioural Economics and Its Impact on Competition Policy' (ACM 2013) <<http://www.oxera.com/Oxera/media/Oxera/downloads/reports/Behavioural-economics-and-its-impact-on-competition-policy.pdf?ext=.pdf>> accessed 22 March 2017 .

⁸⁷ Lavrijssen (n 15) supra. pp. 16.

⁸⁸ See on these factors: Daniel Kahneman and Amos Tversky, 'Prospect Theory: An Analysis of Decision under Risk' [1979] 47(2) *Econometrica* 263-292, R. Thaler and C. Sunstein, *Nudge, Improving decisions about Health, Wealth and Happiness* (1st edn, Yale University Press 2008). Michael G. Politt and I. Shaorshadze, 'The role of behavioral Economics in Energy and Climate Policy' (Cambridge University 2011). Herber A. Simon, 'A Behavioral model of Rational Choice' [1955] 69(1) *Quarterly Journal of Economics* 99-118.

the regulatory framework and large investments are necessary, the introduction of new innovations and new paradigms are usually progressive and require pilots and serious tests. Thus in the short-term future, a significant part of the consumers will still depend on big power stations and big grids, especially in the winter. It should be recognized, that the world where distributed generation and small microgrids can do it all is still far, although they are already able to disrupt the markets and regulations that currently govern the power system and envisage the tendency of the future regulation.⁸⁹ ‘Business as usual’ could lead to malfunctions, with grid congestion, expensive short notice network upgrades and inadequate generation at peak times.⁹⁰ The objective of the next section is to provide some recommendations to the regulation of electricity markets that takes into account the obstacles for the integration of active consumers and prosumers detected in this section.

4. How to deal with the obstacles for the new market design?

4.1. Dealing with the rights and obligations of prosumers.

37. The Winter package tries to provide a legal framework for the protection of prosumers. As mentioned above, Article 2(6) of Proposal for the amendment of the electricity Directive defines active customer as a customer or a group of jointly acting customers who consume, store or sell electricity generated on their premises, including through aggregators, or participate in demand response or energy efficiency schemes provided that these activities do not constitute their primary commercial or professional activity.⁹¹ If the active customer consumes, stores or sells the energy which is generated within his or its premises, including a multi-apartment block, a commercial or shared services site or a closed distribution system, then the active customer is also a *renewable self-consumer*.⁹²

38. The Winter package assumes the necessity to protect prosumers since they contribute to a clean energy system and they could encounter some retaliation by traditional utilities, which could face a financial ‘death spiral’.⁹³ Thus the active consumers, including renewable self-consumers, are granted some specific rights. First, they cannot be subject to disproportionately burdensome procedures.⁹⁴ Moreover, they shall be subject to cost reflective, transparent and non-discriminatory network charges, accounting separately for the electricity fed into the grid and the electricity consumed from the grid.⁹⁵ In addition, their distributed generation facilities may be managed by a

⁸⁹ Green Alliance, (n 23) supra

⁹⁰ Ibid.

⁹¹ Proposal for the amendment of the electricity Directive (n 36) supra. Art 2(6).

⁹² Commission, ‘Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable source’ COM (2016) 767 final/2. (Proposal for a Renewable Energy Directive) Article 2(aa). Article 21 (1)

⁹³ See footnote 78.

⁹⁴ Proposal for the amendment of the electricity directive, (n 34) supra. Article 15 (1).

⁹⁵ Ibid.

third party for installation and operation, including metering and maintenance.⁹⁶ They also can participate in the markets through local energy communities,⁹⁷ which are also protected due to their specific characteristics in terms of size, ownership structure and the number of projects that can hamper their competition on equal footing with large-scale players.⁹⁸

39. In addition, prosumers which are also self-consumers are entitled to be part of power purchase agreements,⁹⁹ to maintain their rights as consumers, and not to be considered as energy suppliers if they feed into the grid less than 10 MWh for households and 500 MWh for legal persons on an annual basis.¹⁰⁰ They are also entitled to receive a remuneration according to the market value of the electricity fed in.¹⁰¹

4.2. Dealing with the evolving role of DSOs

40. The Winter package also acknowledges the evolving role of DSOs. It conceives that DSOs play a key role in facilitating the flexibility services delivered by prosumers, aggregators and demand response to reach the market in a transparent and non-discriminatory way.¹⁰² The assumption is that the DSO procures the services for an efficient operation of their networks, but they do not compete in delivering these services themselves.¹⁰³

41. An important, and sometimes forgotten, aspect for the introduction of competition in retail markets is data management.¹⁰⁴ The Winter Package addresses this issue leaving

⁹⁶ Ibid. Article 15 (2).

⁹⁷ Ibid. Article 2(7) defines them as “an association, a cooperative, a partnership, a non-profit organisation or other legal entity which is effectively controlled by local shareholders or members, generally value rather than profit-driven, involved in distributed generation and in performing activities of a distribution system operator, supplier or aggregator at local level, including across borders”

⁹⁸ Proposal for a Renewable Energy Directive (n 92) supra. Recital 55

⁹⁹ Ibid. Article 2(cc) defines power purchase agreement as “a contract under which a legal person agrees to purchase renewable electricity directly from an energy generator.” Therefore, natural persons are not entitled.

¹⁰⁰ Ibid. Article 21. Perhaps, it is not the best idea to regulate the amount of energy at the EU level. Energy generated by SV and wind varies depending on the weather conditions which are different in every Member State. A better approach may be to regulate a maximum and allow MS to establish lower values at the national level.

¹⁰¹ Ibid.

¹⁰² Proposal for the amendment of the electricity directive, (n 36) supra. Article 32.

¹⁰³ ACER and CEER, ‘European Energy Regulators Overview Paper: Initial Reaction to the European Commission’s proposal on Clean Energy’, (2017). pp 2. This is expressed for instance by the limited possibilities for the DSOs to own, develop, operate and manage recharging points for electric vehicles and energy storage facilities. DSOs also define standardized market products to ensure effective participation of market participants.

¹⁰⁴ See on data management models, CEER, ‘Review of Current and Future Data Management Models’ (2016) < http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Cross-Sectoral/2016/C16-RMF-89-03%20CEER%20Review%20of%20Data%20Management%20Models%20Final.pdf > accessed 29 May 2017.

Member States leeway to designate the *eligible parties* that have access to the data (including metering and consumption data).¹⁰⁵ Member States also decide which data management model will apply provided that they ensure efficient data access and exchange in a transparent and non-discriminatory manner.¹⁰⁶ Thus it opens the possibility for DSOs to have access to consumption data and act as data manager by providing to any eligible party, with the explicit consent of the final customer, access to data of the final customer.¹⁰⁷ It could be argued, that in their role as neutral market facilitator, DSOs are in a good position to manage commercial data that could help integrate flexibility services under the supervision of regulatory authorities.¹⁰⁸

42. The Winter package also recognises that DSOs and TSOs need to enhance their cooperation in system operation, investment planning, data exchange and in ensuring the security and safety of the system.¹⁰⁹ It is also important to clarify the role of DSOs beyond its core functions.¹¹⁰ Even if there are good arguments to defend that system operators must confine themselves to their core functions since DSOs have network monopolies that could potentially distort competition,¹¹¹ the evolving role of DSOs and the urgency of the energy transition could provide arguments to leave some leeway to system operators to innovate by developing other tasks under some strict conditions.¹¹² DSOs could be allowed to fulfil competitive non-core functions temporary to stimulate the energy transition and promote competition, provided that they are supervised by national authorities and are sufficiently unbundled from commercial players in the market. National authorities should balance carefully the short and long term interests of the consumers in delineating the DSOs' core and non-core tasks, considering the relevant economic, social and technological circumstances of each region.¹¹³

¹⁰⁵ Proposal for the amendment of the electricity directive, (n 36) supra. Article 23. Nonetheless, the Commission reserves the competence to regulate a common European data format and non-discriminatory and transparent procedures for accessing the data. See Article 24.

¹⁰⁶ Ibid.

¹⁰⁷ Ibid.

¹⁰⁸ CERRE (n 11) supra. pp 29

¹⁰⁹ For instance, see Proposal for a revised electricity Regulation (n 9) Article 51(2) and Article 32. See also CEER (n 63) supra. pp 16.

¹¹⁰ Its core function is to transport the electricity from the distribution network to the consumers. They have to operate and develop their distribution networks to grant long-term viability of their networks. Some examples of non-core activities are the provision of flexibility services (storage services, demand response programs) or infrastructure provision for electric vehicles. In theory, most of these activities are, or can be, competitive. See also CERRE, (n 11) supra and Ecorys (n 1) supra.

¹¹¹ CEER (n 63) supra. pp 6, 9-11 argues that the more that DSOs are involved in non-core activities, the greater the need for regulatory control or unbundling. They also define some non-core activities.

¹¹² Think, 'From Distribution Networks to Smart Distribution System' (2013) <http://cadmus.eui.eu/bitstream/handle/1814/27615/THINK_Topic_12.pdf?sequence=1&isAllowed=y> accessed 29 March 2017 and Ecorys, (n 1) supra. par. 6.3.2.

¹¹³ According to, Proposal for the amendment of the electricity Directive (n 36) supra. Articles 33 and 36, in principle, DSOs shall not own, develop, manage or operate energy storage facilities or recharging point for Electric Vehicles, unless others have not shown their interest. See also the regulators' position, ACER and CEER 'European Energy Regulators' White Paper # 2 The Role of the DSO Relevant to European Commission's Clean Energy Proposals' (2017) <

4.3. Dealing with the introduction of Implicit Demand Response.

43. As explained above, demand response can be implicit or explicit. Both permit consumers more participation in the market. Demand response is already operating in Europe, however its implementation in the household sector is still limited. Once the obstacles have been identified, some recommendations are provided to an adequate introduction of this development in the energy markets.

44. With regard to implicit demand response,¹¹⁴ as explained above the characteristics of the market influence the benefits of dynamic pricing. This advises against a “one size fits all” approach and justifies that market mechanisms introduce dynamic pricing step-by-step when consumers preferences really demand it.¹¹⁵ Retailers should be free to design tariffs that include dynamic pricing but consumers should be free to choose between tariffs that do not fluctuate during the day since they may not be able to change their personal circumstances and daily routines.¹¹⁶

45. Secondly, it is important to inform consumers about the possible costs and benefits of dynamic retail pricing.¹¹⁷ The complexity that dynamic tariff introduces in the calculation of electricity prices may increase the importance of the role of consumer protection provisions, including transparency requirements. Although specific consumer protection provisions already exist,¹¹⁸ the Winter package introduces new obligations regarding the billing requirements,¹¹⁹ it prohibits all switching related charges, except for early termination fees on fixed term contracts,¹²⁰ and recognize a right to free access to at least one certified energy comparison tool.¹²¹ Nonetheless, the success of these provisions may depend more on the development of consumer law in the Member States and the monitoring of the market by National regulatory authorities and consumer associations rather than their recognition at the EU level.¹²² The relationship between the consumers

http://www.acer.europa.eu/Official_documents/Position_Papers/Position%20papers/WP%20ACER%2002%2017.pdf > accessed 24 May 2017

¹¹⁴ This section builds on Euroelectric (n 3) supra and SEDC (n 54) supra.

¹¹⁵ For instance, benefits of dynamic prices without automatization are less relevant. EU Ecogrid showed that a customer with manual control gave a 60 kW total peak load reduction, while automated or semi-automated customers gave an average peak reduction of 583 kW. See results of EU ECOgrid in Commission, ‘Impact assessment of the revised rules for the electricity market, ACER and risk preparedness’ SWD (2016) 410 final. Annex 8

¹¹⁶ BEUC, ‘Do’s and Don’ts for Smart, Flexible Electricity Offers’ (2017) < http://www.beuc.eu/publications/beuc-x-2017-018_mal_dos_and_donts_for_smart_flexible_electricity_offers.pdf > accessed 30 April 2017. The same is recommended by Euroelectric (n 3) supra.

¹¹⁷ BEUC, *ibid*, proposes an information campaign targeting different consumer segments and coordinated by consumer organizations and national regulatory authorities.

¹¹⁸ See Electricity Directive (n 59) supra and Directive 2012/27/EU of the European Parliament and the Council of 25 October 2012 regarding energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC [2009] OJ L 315/1 (Energy Efficiency Directive).

¹¹⁹ Proposal for the amendment of the electricity Directive (n 36) supra. Article 18. See also Lavrijssen (n 10) supra.

¹²⁰ *Ibid*. Article 12

¹²¹ *Ibid*. Article 14

¹²² European Commission justified the introduction of these new provisions after the study IPSOS, ‘Second consumer market study on the functioning of the retail electricity markets for consumers in the EU’ (DG

and the retailers in a desired liberalized market, although special, in principle should be governed by private law and general consumer protection provisions rather than introducing detailed ex ante regulatory requirements of, *inter alia*, the billing conditions. Consumer law, as it is in the European Union, has enough provisions and mechanisms to deal with, for instance, the transparency or unfairness of the clauses to switch from one provider to another.¹²³ Though, more detailed, special consumer protection provisions seems to be justified in the initial stage of the transition towards a Smart Energy System; as competition flourishes and consumers may be more empowered, the role of these special provisions may diminish and the role of general consumer law (and competition law) may grow in protecting energy consumers.

46. In the third place, consumers can only benefit from dynamic retail pricing, if they have the access to a smart meter and a dynamic price contract. The Winter package requires that if consumers choose to engage in a dynamic pricing scheme but the necessary metering equipment is not in place, they should be entitled to a smart meter with that functionality, although they may need to bear the cost of the installation.¹²⁴ Thus the access to dynamic pricing is also projected in countries where a wide roll-out of smart meters has not been planned. In addition, the roll-out of smart meters should be combined with a scrutiny of the market by data privacy authorities too.

47. In regard to the contract offers, retailers should have contractual freedom to design the offers that include dynamic pricing, which is in harmony with the principle of free competition in the retail markets.¹²⁵ They are better placed to target consumers which are prone to these kind of contracts. Nonetheless, under certain conditions,¹²⁶ Member States could be entitled to allow transitory regulated tariffs that could help to calculate the tariffs for those consumers that do not have a smart meter yet¹²⁷ and protect vulnerable consumers. According to the Spanish regulator, the Spanish experience, where the consumer can select to stay in a dynamic regulated tariff, which is calculated by the

Justice and Consumers, 2016). However, as that study also shows, the problem sometimes is not the lack of regulation but that electricity companies do not comply with the information requirements which are already in the regulation. This suggests that it is also important to grant consumer rights in civil courts and the empowerment of consumer organizations.

¹²³ The role of national consumer law is still very important. However, ECJ has been lately very active in the protection of consumers with regard to financial-related contracts which are complex contracts like the electricity supply contracts. See Case C-421/14 *Banco Primus SA v Jesús Gutiérrez García* [2017] ECLI:EU:C:2017:60 and Joined Cases C-154/15 and C-307/15 *Francisco Gutiérrez Naranjo v Cajasur Banco SAU* [2016] ECLI:EU:C:2016:980. For a review of the case law of the ECJ: Evelyne Terryn, Gert Straetmans and Veerle Colaert, *Landmark Cases of EU Consumer Law* (1st edn, Intersentia 2013).

¹²⁴ Proposal for the amendment of the electricity Directive (n 36) supra Article 21 and Article 11 for the right to have a dynamic contract.

¹²⁵ Euroelectric (n 3) supra.

¹²⁶ A market intervention must be justified in the general economic interest; comply with the principle of proportionality; and the public service obligation should be clearly defined, transparent, non-discriminatory and verifiable; as well equal access for EU electricity companies to consumers should be guaranteed. See Case C-265/08 *Federutility and Others v Autorità per l'energia elettrica e il gas*. [2010] ECLI:EU:C:2010:205.

¹²⁷ In the Spanish case, those consumers that still do not have a smart meter which is able to calculate dynamic pricing are priced according to the consumption patterns of an “average consumer” which is calculated by the TSO.

government and paid to the five reference suppliers, or switch to the liberalized market where they negotiate the price of Kwh and the conditions directly with the supplier, has shown that the regulated tariff was the cheapest option in times where the energy prices were low.¹²⁸ This is not the Commission's desired option however.¹²⁹

48. In addition, dynamic pricing will probably only work when the energy component has a sufficiently high share in the electricity bill to provide incentives to the energy consumers. Otherwise non-energy components, such as network tariffs, will probably blur the benefits of dynamic pricing.¹³⁰ Nonetheless, it is possible to design dynamic network tariffs that could avoid distortions on the consumer's perception of the energy component¹³¹ and at the same time it allows DSOs to recoup their costs in a context where their role also increase. The onus is on the national regulatory authorities that are responsible for setting tariff methodologies for access to energy networks because current European legislation includes only the main principles.¹³² With regard to tariff design, the Winter package only emphasizes the relevance of the flexibility principle¹³³ and clarifies how some of these principles should be applied.¹³⁴ Thus the recognition of these principles at the EU level leave the national regulatory authorities sufficient leeway to design the tariff methodologies that fit best both geographical conditions including the extent of introduction of distributed energy in a certain area.¹³⁵ A fairness element should also be taken into account since there is a risk that consumers with less access to flexibility are charged higher tariffs, whilst prosumers that can access to storage solutions and temporarily go off-the grid contribute less to the maintenance of the network.¹³⁶

¹²⁸ CNMC, 'Informe de Supervisión de las Ofertas del Mercado minorista de gas y electricidad para consumidores domésticos y pymes. Junio 2016 [Report on gas and electricity Retail Market Offers for household consumers and SMEs. June 2016.]' (2016) < <https://www.cnmc.es/2016-11-15-la-cnmc-publica-el-informe-sobre-la-comparativa-de-ofertas-de-gas-y-electricidad-para> > pp 61.

¹²⁹ The Commission's assumption is that vulnerable customers' situation can be addressed by energy efficiency and social policy measures in the mid-term. It casts doubts on the effects of price regulation to help vulnerable consumers. Nonetheless, it is more lenient with targeted pricing regulation than with blanket pricing regulation. See Commission (n 115) supra.

¹³⁰ Euroelectric (n 3) supra.

¹³¹ See for instance the network design in Portugal or France. See REF-E, AF Mercados and Indra, 'Study on tariff design for distribution systems' (DG ENER 2015).

¹³² They include the principles of transparency, non-discrimination, objectivity, flexibility, non-distortion, cost recovery, cost-reflectiveness and predictability. See CEER, CEER, 'Electricity Distribution Network Tariffs: CEER Guidelines of Good Practice' (2017) < http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Electricity/2017/CEER%20DS%20WG%20Best%20Practice%20Tariffs%20GGP%20%20external%20publication_final.pdf > and Lavrijssen (n 10) supra.

¹³³ Proposal for a revised electricity Regulation (n 9) supra. Article 16(1) adds "*and flexibility*" as a principle to regulate network charges.

¹³⁴ Lavrijssen (n 10) supra. For instance, it clarifies that the principle of non-discrimination is applicable to distribution network connections as well as to storage. Proposal for a revised electricity Regulation (n 9) supra. Article 16.

¹³⁵ Ibid

¹³⁶ See footnote **Error! Bookmark not defined.**

4.4. Dealing with the introduction of Explicit Demand Response

49. Regarding explicit DR, regulatory burdens that restrict aggregators to operate independently from the consumer's retailer, which is potentially its competitor, must be removed.¹³⁷ In this sense, it is welcomed that the mandate of the Winter package ensures that national regulatory framework encourages the participation of aggregators in the retail market.¹³⁸ Nonetheless, Member States should not wait for the Directive coming into force to remove these obstacles. In addition, the Winter package also acknowledges the right of consumers and small businesses to participate in the market through aggregators subject to compliance with competition rules.¹³⁹ DSOs should not act as an aggregator, as according to unbundling requirements they should not participate in the electricity supply market.¹⁴⁰ Moreover, about the possibility of introducing local opt-out schemes in Europe, they should not be forbidden and some pilots would be welcomed to analyse the possible effects. Nonetheless, under the principle that consumers should never be locked into products and services which do not reflect their personal circumstances, opt-in schemes are more advisable.¹⁴¹

4.5. Dealing with the birth of P2P trade and the tendency of the future regulation

50. Although many questions remain unanswered, P2P might become a reality in the next decade. After Section 3 has envisaged how a P2P trading scenario could look like and some regulatory obstacles that its birth and rise confront, this section tries to provide some recommendations to integrate adequately this development in the energy system as a way to fully empower consumers.

51. In a first stage, regulation should eliminate some regulatory constraints to promote P2P systems, such as licensing requirements to supply energy.¹⁴² Those licences generally try to grant a minimum of organizational, financial and technical characteristics for a good performance of the tasks as energy suppliers.¹⁴³ It is thus welcomed that the Winter package prohibits self-consumers which feed into the grid less than 10 MWh for

¹³⁷ See SEDC (n 54) supra.

¹³⁸ Proposal for the amendment of the electricity Directive (n 50) supra. Article 17(3). It recognises a right for each aggregator to enter the market without the consent from other market participants and the prohibition of requiring them to pay a compensation to suppliers. It also emphasizes the need of transparent rules in regard to data exchange and the creation of resolution mechanisms between market participants.

¹³⁹ Proposal for a revised electricity Regulation (n 9) Article 3 (d).

¹⁴⁰ See the unbundling requirements in Electricity directive (n 59) supra. Art 27. Ikaheimo et al (n 54) supra also adds that "if they performed load control only to improve network operation (for example voltage control), they would distort market-based load control. Besides, load control during system contingencies can also be carried out by a deregulated aggregator participant based on DSO's request"

¹⁴¹ Results in US shows that consumers need at least two years to fully adjust to opt-out schemes. See Deryugina et al (n 53) supra. CERRE (n 48) supra proposes opt-out collective auctions. The idea is that consumers and their energy consuming characteristics could be identified, and companies invited to bid to supply them, with the winner being the supplier who offers the best deal. This is effectively competition for, rather than in, the market, and mirrors a number of collective opt-in schemes.

¹⁴² Butenko (n 14) supra detects some of them in Dutch Energy law, for instance, the impossibility of supplying energy to small and medium consumers in the absence of a license.

¹⁴³ Ibid

households and 500 MWh for legal persons on an annual basis from being considered energy suppliers.¹⁴⁴ It implies that prosumers that would engage in P2P trading would not lose their rights as consumers and thus they would not have to comply with the stricter requirements of business-to-consumer (B2C) regulation and more severe tax regimes.

52. The prohibition of being considered as energy suppliers also suggests that prosumers that would like to engage in P2P trading would not have to meet Universal Service Obligations (USO).¹⁴⁵ Nonetheless, in a context where P2P digital platforms thrive and more consumers have access to facilities to sell energy to consumers directly, future research should evaluate whether these exemptions could create an uneven playing field. This could be the case where P2P platforms capture the most profitable consumers, whilst traditional supply companies, which face the USO, are left with the most expensive consumers, for instance, island consumers who do not enjoy economies of density and may not have access to a liquid P2P market.¹⁴⁶ The idea for introducing a USO is protecting unprofitable, and thus weak, consumers from exclusion in a liberalised market.¹⁴⁷ It should be examined whether prosumers engaged in P2P platforms could cherry pick the consumers that can have access to their service,¹⁴⁸ whilst traditional suppliers would have to supply all the consumers that demand them. A relevant question therefore seems to be how the USO ought to be designed in a context of P2P trading where prosumers would not be capable of facing that requirement and there would be consumers that would not have access to liquid P2P markets.¹⁴⁹

53. Nonetheless, it is easier to visualize that the role of regulation in the retail market seems to evolve towards more relevance of private law, namely, contract law, consumer law and competition law, still within the framework of necessary safeguards of ex ante regulation to ensure security of supply, protection of vulnerable consumers and the viability and safety of the network. The reason is that prosumers that sell their energy to other peers would have to deal more with terms and conditions in the contracts which they would sign with other parties or digital market platforms, rather than with the security of supply in general, since non-specialised prosumers/consumers are not the ideal market players to deal with this. The context of more relevance of private law suggests that energy regulators may have to become more interdisciplinary and take into account not only regulation but also competition concerns, data privacy and general consumer law. This could generate arguments to change the model of energy market regulation

¹⁴⁴ See footnote 100.

¹⁴⁵ Electricity directive (n 59) supra. Article 3(3) and 3(7).

¹⁴⁶ CERRE ‘Public service obligations and competition’ (2013) < http://www.cerre.eu/sites/cerre/files/130318_CERRE_PSOCompetition_Final_0.pdf > accessed 22 May 2017. pp 6. Nonetheless, this problem would be less relevant if the traditional suppliers and those who runs the P2P platforms are the same entity. In this case they would have just to adjust their business models. However, it is expected that some business models only participate in the P2P market.

¹⁴⁷ Matthias Finger and Dominique Finon ‘From the “public service” model to the “universal service” obligation’ (2011) <http://www2.centre-cired.fr/IMG/pdf/Finger_Finon_Public_service_Universal_service.pdf> accessed 22 May 2017.

¹⁴⁸ Cherry-picking is precisely the idea behind a P2P trading system. For instance, if they decided to sell their energy to a closer neighbor, it would be less costly for DSOs to transport that electricity and thus the charges paid in that transaction.

¹⁴⁹ Finger (n 147) supra. pp 10-17 provides different designs of the USO and the way to finance it.

towards a model of a multiple interdisciplinary agency, such as the ones already in place in UK, the Netherlands, Spain or Finland.¹⁵⁰

5. The future of energy regulation: conclusions

54. In the context of a transition to a more sustainable energy system, consumers will play a more important and active role in a new decentralised energy system. Some technological innovations ought to help them achieve this new role where they become more active by storing, buying and selling electricity. Thus the role of regulation is to integrate these new technologies and roles of new market participants in the retail market in order to achieve energy efficiency objectives. This work has identified the main legal and related non-legal barriers in the current legal framework that prevent a wider implementation of these technologies. It also conceives a future where consumers will make use of all of these development and will be empowered to trade energy among themselves. The work has tried to provide some regulatory recommendations for an appropriate integration of these innovations in the energy market and in energy market regulation.

55. First of all, it is important to recognize the definition of prosumers in the regulation. In this sense, it is to be welcomed that the Winter Package brings legal certainty in this regard. The so-called active customers are entitled to specific rights, including the prohibition from being considered suppliers if they feed into the grid less than a maximum of megawatts, which may vary during the legislative process. They are also entitled to be subjected to cost reflective, transparent and non-discriminatory network charges and they cannot encounter disproportionately burdensome procedures.

56. Secondly, it has been argued that the new evolving role of the DSOs as neutral market facilitators should be recognized in regulations. DSOs are well suited to facilitate that flexibility services connected to their grids can reach the market and to facilitate the developments of local flexibility markets. It is also recommended that Member States investigate the possibility that the Winter package opens for designating DSOs as an eligible party that could become a data manager and have access to commercial data. This could also help to integrate other market players, such as aggregators, in a neutral way. Lastly, they should only be allowed to fulfil competitive non-core functions temporarily. All of these functions should be performed under the supervision of national authorities and be subject to a sufficient degree of unbundling of the system operation and data management tasks, from commercial players and competitive activities in the energy market.

57. Thirdly, in regard to the introduction of DR, a “one-size-fits-all” approach has not been recommended. The different characteristics of the markets across the EU, such as geographical conditions, volatility of prices and automatization influences the benefits of dynamic pricing for consumers. Thus it is better that retailers target through market mechanisms the consumers that really demand it. Retailers should be free to design dynamic tariffs but consumers must be free to choose between tariffs that do not fluctuate

¹⁵⁰ It must be raised that the models are quite different among the cited countries. See on pros and cons of interdisciplinary agencies, OECD, ‘Summary Record: of the 123rd Meeting of the Competition Committee held on 15-19 June 2015: Key points of the Roundtables on Changes in Institutional Design.’ DAF/COMP/M(2015)1/ANN9/FINAL
<[http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP/M\(2015\)1/ANN9/FINAL&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP/M(2015)1/ANN9/FINAL&docLanguage=En)> accessed 22 May 2017.

during the day. Moreover, Member States should also clarify the role of aggregators in the retail market and let them operate independently of retailers to introduce more choices for consumers. In addition, consumers should be able to switch between different options easily which make opt-in schemes more advisable.

58. Fourthly, another objective of this work has been to assess the evolvement of regulation in order to empower consumers to trade energy between themselves by making use of digital platforms and blockchain technology. It has been argued that regulation should remove some regulatory burdens which make the transactions of electricity among peers difficult, such as licensing requirements or USOs. Even if the rise of some technologies, such as blockchain, could eliminate some intermediaries, such as the retailers, it also make others appear such as the digital platforms to keep in contact buyers and sellers. This new scenario of shared energy raises new legal questions about the legal nature and the obligations of these new platforms that may be solved by a CJEU's future decision in the case *Asociación Profesional Élite Taxi v Uber Spain*. Nonetheless, at least in a first stage, P2P networks are more likely to complement, rather than substitute, the traditional retail model which will face the USO of supplying every customer that demand energy and to guarantee non-P2P transactions.

59. In conclusion, though, more detailed consumer protection provisions seems to be justified in the most immediate future and regulators may have to intervene to limit the market power of some service suppliers promoting the rise of P2P networks, the tendency seems to be that the role of ex ante provisions diminish and general consumer law and competition law become a more relevant mechanism to protect energy consumers. This suggests that the role of future regulation may be more focused on granting consumer rights in civil courts, the empowerment of consumer organizations and ex post regulation (competition enforcement). Regarding the institutional design, this expected importance of competition law, consumer law, as well as of data privacy issues may justify the creation of regulators with more interdisciplinary expertise. This could stimulate Member States to be in favour of a model of inter-disciplinary market authorities which are in charge of different legal areas, as it is the case in UK, Spain, the Netherlands or Finland, which could combine the legal concerns coming from several fields.