

December 2019

Distribution network tariff design under the Clean Energy Package: legal requirements and policy impacts

December 2019

Disclaimer

While all information contained in this paper has been obtained from sources believed to be accurate and reliable, ClientEarth and the author of this paper do not accept responsibility for any errors, omissions, inaccurate information, or any decisions made in reliance on this paper. Any inaccuracies may be reported to chanson@clientearth.org.

This paper is not offered as advice on any particular matter and must not be treated as a substitute for specific advice. In particular, information in this paper does not constitute legal or professional advice. Advice from a suitably qualified professional should always be sought in relation to any particular matter or circumstances.

December 2019

Contents

Executive Summary	4
Background	6
1 Types of network tariffs and their relative merits	7
1.1 Tariff categories	7
1.2 Trends in tariff design	7
1.3 Debates on tariff design	8
1.3.1 Arguments against high contracted capacity and fixed charges	8
1.3.2 Arguments for capacity charges	9
1.3.3 Critical peak charges	10
1.3.4 Trade-off between cost-reflectivity and social outcomes	10
2 Electricity Regulation framework	11
2.1 Cost-reflectivity	12
2.2 Foster market integration, security of supply and innovation	13
2.3 Support system efficiency over the long-term	13
2.4 Efficient operation and development of networks in short-term	13
2.5 Not disincentivise self-generation, self-consumption or demand response	13
2.6 Transparency	14
2.7 Time-differentiated (discretionary)	14
2.8 Variable charging (discretionary)	14
3 Analysis of how tariff categories meet Electricity Regulation requirements	14
3.1 Example one: large fixed component	15
3.2 Example two: large volumetric component	16
3.3 Example three: large capacity component	18
3.4 Connecting Electricity Regulation requirements with current energy plans	20
4 Conclusion	21

December 2019

Executive Summary

Energy systems within the European Union (EU) are transitioning away from centralised, thermal energy generation towards greater penetration of decentralised renewables and smart technologies. The European Union's Clean Energy for all Europeans Package (CEP)¹ provides a framework for accelerating the transition towards a decentralised energy system that is smarter, cleaner and achieves the EU's renewable energy, energy efficiency and emissions reduction targets.

Distribution networks will play an important role in this transition, as they will be responsible for integrating new energy market participants (such as prosumers), technologies (such as battery storage) and activities (such as demand response) at increasing scales. A critical issue in implementing the CEP will be designing network tariffs that provide appropriate incentives for the energy transition at the distribution level. Current trends in network tariff design indicate that Member States may need to reconsider their approach in order to comply with the CEP's requirements, which will take effect from 1 January 2020.

The purpose of this paper is to analyse what kinds of distribution network tariffs would meet the requirements of the CEP. The options for tariff design can be broadly classified into fixed (€/point of delivery), volumetric (€/kWh) and capacity (€/kW) charges. The choice of design has a crucial bearing on the incentive environment for different market participants and the efficiency of grid utilisation.

The Electricity Regulation² is the main instrument in the CEP dealing with distribution network tariff design. It includes a set of competing requirements, many similar to the preceding regulatory framework in the Third Energy Package.³ These requirements include that tariffs are transparent, cost-reflective and non-discriminatory. However a key point of differentiation is the Electricity Regulation's reference to fostering flexibility as a goal of tariff design, a relevant feature for cost-efficiently developing a decentralised, renewables-based energy system.

Weighing up the competing design requirements in the Electricity Regulation, some tariff designs appear more likely to strike the right balance than others. A high fixed charge could impede flexibility and therefore constrain the transition to a decentralised energy system. A high volumetric tariff could encourage efficiency and decentralised generation but is not the most directly reflective of network costs. A high capacity charge can be more reflective of network costs if it varies according to changing network conditions and is based on consumption from the grid, but might not be sufficiently foreseeable.

The tariff designs that appear most likely to meet more requirements of the CEP are a high volumetric component that varies dynamically with grid use (volumetric time-of-use) and a charge based on electricity use during critical network periods (critical peak capacity charge). Member

¹ See <https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans>.

² Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast) [2019] OJ Series L 158/54.

³ See <https://ec.europa.eu/energy/en/topics/markets-and-consumers/market-legislation/third-energy-package>.

December 2019

States should be careful to avoid tariffs that are too fixed, as these are less likely to meet requirements around fostering flexibility.

Tariffs across the European Union have traditionally been mainly volumetric, however there is a trend towards a higher capacity-based component. In some Member States, this capacity charge is not dynamic – it is based on the contracted capacity of the consumer. A high contracted capacity charge of this nature might limit flexibility and therefore not align with the requirements of the CEP.

Taking these considerations into account, some Member States may need to reconsider their approaches to tariff design, including over-reliance on blunt, fixed tariffs, and the current trend towards contracted capacity tariffs. These kinds of tariffs could fail to align with the requirements of the CEP and so raise the prospect of being open to legal scrutiny.

December 2019

Background

Energy systems within the European Union (EU) are undergoing a transition away from centralised, thermal energy generation toward greater penetration of decentralised renewable generation and smart technologies. The European Union's Clean Energy for all Europeans Package (CEP) provides a framework for accelerating the transition towards a smarter, cleaner energy system and achieving the EU's renewable energy and emissions reduction targets.

A key element of this framework is the transforming role of distribution networks in future energy systems. Distribution networks will play an important role in facilitating the integration of new energy market participants (such as prosumers), technologies (such as battery storage) and activities (such as demand response). A critical issue for Member States will be designing distribution network tariffs that provide appropriate incentives for the energy transition at the distribution level.

The key piece of legislation addressing distribution network tariff design is the Electricity Regulation.⁴ Member States should currently be reviewing whether their existing distribution network tariff designs accord with the terms of the Electricity Regulation, as the relevant provisions will apply from 1 January 2020.⁵

The purpose of this document is to provide guidance for Member States on what kinds of distribution network tariffs would meet the requirements of the CEP.

Section 1 outlines various charging options, trends among Member States, and the policy debate surrounding network tariffs. Section 2 sets out the key requirements from the Electricity Regulation. Section 3 analyses to what extent the various options would be compliant with the Electricity Regulation.

For simplicity, as this paper focuses on distribution level tariffs, any reference to the term 'tariff' or 'network tariff' is to a distribution network tariff.

⁴ Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast) [2019] OJ Series L 158/54.

⁵ Electricity Regulation, art 71.

December 2019

1 Types of network tariffs and their relative merits

Network tariffs span a spectrum between more fixed charges (that is, charges that are relatively unaffected by the capacity or volume a consumer demands) and more variable charges (fluctuating according to capacity or volume). In general, tariff design involves a combination of fixed, capacity and volumetric charges. This section describes these tariff categories and summarises the policy arguments around their application.

1.1 Tariff categories

Fixed (€/point of delivery): the same charge applies to a class of consumers (such as residential consumers within a given area) regardless of each consumer's consumption level or capacity requirement.

Volumetric (€/kWh): the charge depends on the consumed amount. It can be at a flat rate or incorporate time-of-use elements where different charges apply depending on the day, week or year. Key types of time-of-use charges are:

- (a) static, where prices for given time periods are pre-defined based on historical data;
- (b) critical peak charge, where on a limited number of occasions per year, the system operator informs consumers within a prescribed timeframe (usually a day ahead) that a critical period will occur, during which the value of the tariff will be particularly high (a pre-determined price) and consumers are charged according to their electricity use over such periods.

Capacity-based (€/kW): consumers are charged based on their capacity. These charges can be any or a combination of:

- (a) pre-set on an ex ante (forward-looking) basis, based on the consumer's maximum contracted or installed capacity; or
- (b) variable on an ex post (retrospective) basis, with amounts determined by the consumer's actual peak demand within a given period or at times of peak system demand. This requires consumers to be equipped with smart metering technologies that enable them to respond to different conditions on their distribution network.

Although tariff design usually involves a combination of different types of tariffs, the proportionate weight given to a particular type of tariff has a crucial bearing on the incentive environment for various market participants and the efficiency of grid operations. This is explained further below.

1.2 Trends in tariff design

In a traditional energy system in which electricity was largely supplied by centralised, baseload generation and consumers were mainly passive recipients of electricity, network charges tended to be predominantly fixed or volumetric and flat. In 2016, 69% of revenue from households for

December 2019

electricity was charged through volumetric tariffs.⁶ A largely flat volumetric tariff was a reasonable design for network charges, because the volume of electricity a consumer used tended to be an adequate proxy for the cost of network services to supply that consumer.

However, the costs of network services to supply customers are generally determined by the peak demand requirements placed on the grid, rather than the volume of energy distributed. The energy transition and its opportunities for greater consumer participation (such as through household solar) have seen more consumers adopt technologies that allow them to reduce their volumetric demand, but not necessarily their capacity requirements. As such, volumetric demand is no longer closely aligned with capacity.

As a consequence, in order to ensure network costs can be covered (and probably to maximise revenue certainty for DSOs), many Member States have increased the capacity component of their network charges.⁷ For instance, from 2017, Italy has made its tariffs largely capacity-based while the Netherlands has eliminated volumetric tariffs altogether, instead relying on a contracted capacity charge.⁸

1.3 Debates on tariff design

The question of optimal tariff design is complex and energy markets experts emphasise that tariff choice should be tailored to the conditions of the relevant jurisdiction. However there are broad themes from the debate which it is useful to extract for the purpose of this paper, as they provide context for the implementation of the Electricity Regulation requirements (set out in Section 2).

1.3.1 Arguments against high contracted capacity and fixed charges

The Regulatory Assistance Project (RAP),⁹ a technical advisory group, argues that fixed charges and the higher contracted capacity components that are being seen across Europe, can be counterproductive to a consumer-centred energy transition.¹⁰ In particular, they note that these

⁶ European Commission, *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) <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52016SC0410&from=EN>. For further examples of different Member States' approaches to tariff design, see Council of European Energy Regulators, *Electricity distribution network tariffs - CEER guidelines of good practice* (January 2017) <https://www.ceer.eu/documents/104400/-/-/1bdc6307-7f9a-c6de-6950-f19873959413> pages 11-12.

⁷ See, for example, Christos Kolokathis, Michael Hogan, and Andreas Jahn, *Cleaner, smarter, cheaper: Network tariff design for a smart future* (January 2018) http://www.raonline.org/wp-content/uploads/2018/01/rap-ck-mh-aj-network-tariff-design-for-smart-future_2018-jan-19.pdf.

⁸ Note that the Netherlands' shift to capacity tariffs is reportedly partly due to the regulator's view that grid costs of DSOs mostly depend on the capacity of the grid, but also because this would reduce administrative costs for DSOs as volume data would not be required. See further Council of European Energy Regulators, above n 6 pages 12 and 31.

⁹ See further <https://www.raonline.org/>.

¹⁰ Kolokathis, Hogan, and Jahn, *Cleaner, smarter, cheaper*, above n 7.

December 2019

inflexible charges remove choice from consumers and hinder broad deployment of demand response and distributed generation.¹¹ This is because a consumer cannot reduce a fixed or contracted capacity charge by changing their demand according to the network conditions at a given time. Rather, a fixed charge is not avoidable and a contracted capacity charge is pre-set when they settle the contract with their energy supplier. Consumers paying contracted capacity or fixed charges are therefore not incentivised to save money by using demand response, or, once the charge has been set, by investing in small-scale storage.

RAP also notes that fixed charges can increase costs for low-usage consumers. Using Germany as an example, RAP demonstrates that low-usage consumers pay disproportionately higher fees compared to high-usage consumers for the delivery of electricity – that is, grid costs are transferred from high-usage to low-usage consumers.¹²

Furthermore, RAP argues that with increasing levels of electric vehicle and other electrification, such charges will exacerbate the problem of under-utilised grid infrastructure.¹³ Efficient grid operation involves using infrastructure to the maximum extent, and efficiency in grid infrastructure involves building the grid to the minimum capacity needed to reliably deliver necessary energy. Relatively inflexible charges would cause avoidable network build-out cost to accommodate new load at peak times, as the charges would not sufficiently encourage consumers to reduce their load at peak times.

RAP takes the view that volumetric time-of-use charges and critical peak pricing avoid these shortfalls.¹⁴ They argue that such charges empower and incentivise consumers to reduce their demand and charges at times of expected or actual peak load by engaging in demand response, self-generation,¹⁵ storage and energy efficiency activities.

1.3.2 Arguments for capacity charges

In contrast to RAP's view, DSO representative bodies tend to support capacity-based tariffs. The European association for DSOs, E.DSO for Smart Grids (E.DSO),¹⁶ notes that a tariff based on a contracted capacity can better reflect the real costs of DSOs, as these costs are largely determined by maximum capacity requirements.¹⁷

¹¹ Ibid, pages 2 and 5.

¹² Ibid.

¹³ Ibid, page 5, and Michael Hogan, Christos Kolokathis and Andreas Jahn, *Treasure hiding in plain sight: launching electric transport with the grid we already have* (January 2018) <https://www.raponline.org/knowledge-center/treasure-hiding-in-plain-sight-launching-electric-transport-with-the-grid-we-already-have/> page 4.

¹⁴ Kolokathis, Hogan, and Jahn, *Cleaner, smarter, cheaper*, above n 7, page 5.

¹⁵ An additional principle that could guide this approach, proposed by RAP, is that customers who produce their own electricity should cover their fair share of grid costs when the grid is heavily loaded but less when it is not - see Kolokathis, Hogan, and Jahn, *Cleaner, smarter, cheaper*, above n 7, page 8.

¹⁶ See <https://www.edsoforsmartgrids.eu/>.

¹⁷ European Distribution System Operators for Smart Grids, *European Distribution System Operators*

December 2019

E.DSO also argues this kind of tariff helps avoid discrimination between grid users owning distributed generation and users who do not.¹⁸ This is because under a volumetric charge, consumers are incentivised to purchase self-generation assets such as solar panels in order to reduce their volumetric demand, but their capacity demand at peak times might stay the same. This would mean the cost for providing those consumers access to the grid would remain the same (as the cost is based on capacity), even though they would be charged a lower network tariff (as it is volumetric). Consumers who do not invest in self-generation equipment could therefore be left with a higher and inequitable network tariff.

E.DSO notes that the rollout of smart meters offers the additional opportunity for consumers to reduce their capacity requirements based on variable conditions. E.DSO considers a forward-looking capacity charge to be preferable to an ex post charge, noting that an ex post charge would penalise consumers who are not able to respond on short notice to changing grid prices.¹⁹

E.DSO also highlights another option of a ‘smart contract’ design that would allow DSOs to contract with grid users to limit their load or production a certain number of times a year for a limited period under agreed conditions in exchange for pricing benefits.²⁰ This type of charge is similar to a critical peak capacity charge, except presumably the DSO would control it, instead of consumers being able to voluntarily respond.

1.3.3 Critical peak charges

An extensive study of the implications of different network tariffs is included in MIT’s Utility of the Future Report.²¹ In relation to a critical peak charge, the authors note it has been successfully used in some power systems.²² On the one hand, they note that, if designed well, such a charge can effectively signal to consumers their marginal contribution to system costs during the few hours of the year that drive the largest share of system costs.²³ On the other hand, they point out that these tariffs fail to capture more regular, hour-to-hour and day-to-day variations in the price of electricity services, and may lack sufficient locational specificity.²⁴ However locational specificity issues could be addressed by differentiating tariff rates by region or DSO within a particular country.

1.3.4 Trade-off between cost-reflectivity and social outcomes

The above examples of different charges highlight the tension between cost-reflectiveness of a tariff and the degree to which it facilitates equitable financial outcomes. For instance, an ex post

for Smart Grids (September 2015) https://www.edsoforsmartgrids.eu/wp-content/uploads/151014_Adapting-distribution-network-tariffs-to-a-decentralised-energy-future_final.pdf.

¹⁸ Ibid, page 9.

¹⁹ Ibid.

²⁰ Ibid, page 10.

²¹ MIT Energy Initiative, Utility of the Future (December 2016) <http://energy.mit.edu/wp-content/uploads/2016/12/Utility-of-the-Future-Full-Report.pdf>, page 83.

²² Ibid.

²³ Ibid.

²⁴ Ibid.

December 2019

capacity tariff quite closely reflects the costs of grid use at peak times, but by levying a charge that is backward-looking, consumers can be disadvantaged and unable to accurately forecast their costs. This transfers the risk of cost recovery from DSOs onto individual consumers. Further, many consumers are not well-versed in understanding how capacity charges work and so do not respond to signals to reduce their costs.²⁵ Consequently, there is a risk that retailers can benefit from this confusion by, for example, offering payment structures that look appealing but from which consumers might not actually benefit.

Debates in tariff design also raise the question of whether tariffs should be designed to achieve social objectives of fairness and equity or whether this should be done through redistributive mechanisms (such as taxation). Arguably, efficient network development would require accurate cost-recovery, whether directly through tariffs or through re-distributive policy. However, there is a legitimate concern that redistributive policies might not be adopted or adequate, and so tariffs that are directly more equitable might be preferable. Member States should take these policy considerations into account in designing appropriate tariffs.

2 Electricity Regulation framework

The Electricity Regulation sets out a series of requirements for distribution network tariff design without prescribing exactly how Member States should meet those requirements. This indicates a degree of discretion in the approach Member States can take to implementation, although there appear to be limitations in the range of tariff structures that would comply with the legislation.

The Electricity Regulation required the Agency for the Cooperation of Energy Regulators (ACER) to provide a best practice report on network tariffs by 5 October 2019.²⁶ However ACER has indicated that such a report will not be issued until late in 2020.²⁷ While the best practice report could lead to a degree of harmonisation across Member States, the Florence School of Regulation notes that requiring a best practice report sends a weaker signal for harmonisation than a network code (an approach which was previously mooted).²⁸

The key provisions dealing with how distribution network charges should be formulated are set out in Article 18 of the Electricity Regulation. Article 18 covers a far broader range of requirements than the equivalent provisions in the preceding regulatory framework, the Third Energy Package,²⁹

²⁵ For instance, a Norwegian study showed that consumers are largely not aware of the term 'capacity' as a possible measure for tariffs: see Velaug Amalie Mook and Rebecca Norrie-Moe, *Consumer survey regarding capacity tariffs* https://www.nve.no/Media/5355/summary_capacity-tariff-survey_tfou_gb_final.pdf.

²⁶ Electricity Regulation, art 18(9).

²⁷ Email correspondence between ACER and ClientEarth, 10 October 2019.

²⁸ Tim Schittekatte and Leonardo Meeus, *Introduction to network tariffs and network codes for consumers, prosumers and energy communities* (July 2018) https://cadmus.eui.eu/bitstream/handle/1814/57164/Technical_Report_Schittekatte_Meeusdf_2018.pdf?sequence=1&isAllowed=y.

²⁹ Directive (EC) 2009/714 of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive (EC) 2003/54 [2019] OJ Series L 211/55, art 37(8).

December 2019

which largely focused on system efficiencies, market integration and security of supply.³⁰ The Third Energy Package did not, for example, mention the concept of flexibility, as Article 18 now does. Outlined below are eight key provisions in the Electricity Regulation relating to the fixed, volumetric and capacity-based spectrum of distribution network charges. There are numerous other tariff-related provisions in both the Electricity Regulation³¹ and the Renewable Energy Directive (for example, restricting the imposition of tariffs on self-consumers),³² however as they do not directly relate to this spectrum, they are not analysed in this paper.

2.1 Cost-reflectivity

Article 18(7) requires that network tariffs must be cost-reflective, taking into account network use, including by active consumers.³³ No definition is provided in the legislation for 'cost-reflective'. In substitution for a definition, some first principles for interpreting the term are set out below.

- A well-accepted aspect of cost-reflectiveness in the tariff design debate is that a network tariff should reflect the cost a consumer imposes on the network.³⁴ This implies that the tariff avoids the need for cross-subsidising consumer classes.
- Article 18(1) of the Electricity Regulation stipulates that network charges must reflect actual costs incurred insofar as they correspond to those of an efficient and structurally comparable network operator and are applied in a non-discriminatory way.
- Cost-reflective therefore can be taken to mean reflecting actual costs incurred by a DSO in accommodating a consumer, where those costs would have been incurred by an efficient and structurally similar DSO.
- This indicates that DSOs are probably required to use reasonable endeavours to accurately assess the future demand across their networks and ensure they are built according to that assessment, so that network costs and charges are justified and not excessive.

The requirement that cost-reflectivity take into account network use, including by active consumers (such as those with self-generation and storage), appears to require that network charges account for the reduced use of the network that active consumers may require (and therefore lower peak capacity requirements than a traditional network would have). It also appears

³⁰ Ibid.

³¹ Additional requirements in the Electricity Regulation that are beyond the scope of this paper are: that the charges reflect the fixed costs of DSOs (art 18(2)); are non-discriminatory (including between distribution and transmission connected generation and against energy storage or aggregation) (art 18(1)); and are not distance-related except where tariff levels provide locational signals at EU level (by taking into account the amount of network losses and congestion caused and infrastructure investment costs) (art 18(1), (3), (5)). In relation to congestion charges, see further art 16.

³² See art 21(2)(ii), requiring Member States to ensure that renewables self-consumers are entitled to generate, store and sell renewable energy within their premises without being subject to discriminatory procedures and charges, and to network charges that are not cost-reflective.

³³ Electricity Regulation art 18(7).

³⁴ Schittekatte and Meeus, *Introduction to network tariffs*, above n 28, page 7.

December 2019

to require that charges account for any reasonable upgrades necessary to maintain network reliability and security with the addition of increasing numbers of active consumers.

2.2 Foster market integration, security of supply and innovation

Article 18(2) requires that network charges provide appropriate incentives to DSOs in order to, in the short and long term, foster market integration, security of supply, and innovation in the interest of consumers in digitalisation, flexibility and interconnection.

It is clear from this provision that tariffs should incentivise security of supply as well as innovation in digitalisation, flexibility and interconnection. This innovation should be in consumers' interests, which can be interpreted to mean their economic, social and environmental interests. A key means to ensure security of supply in the energy market is through the integration and incentivising of flexibility such as demand response technologies.³⁵

2.3 Support system efficiency over the long-term

Articles 18(1), (2) and (8) stipulate that charges must neutrally support overall system efficiency over the long run through price signals to consumers and producers (and regulatory authorities may introduce performance targets for this purpose).

This can be interpreted as requiring that charges reflect the long-term marginal costs. For instance, if it is necessary to allow for an additional megawatt of capacity to be available to consumers at 7pm, then the network tariff should reflect the cost of that increased allowance. This indicates that tariffs should be specific enough to reflect marginal costs.

2.4 Efficient operation and development of networks in short-term

Articles 18(2) and (8) require that charges must incentivise DSOs to conduct the most cost-efficient operation and development of their networks in the short run. Similar to the requirements outlined immediately above, this appears to require that tariffs reflect the short-run marginal costs of the network (for example, energy losses within the network). Another interpretation of a cost-efficient tariff is one that will lead to the overall lowest final cost for serving the electricity needs of all consumers.³⁶ For either of these interpretations, key methods for incentivising DSOs to conduct cost-efficient short-term operation is demand response and encouraging consumers to self-consume electricity (thereby reducing energy losses within the network).

2.5 Not disincentivise self-generation, self-consumption or demand response

Article 18(1) requires that network charges do not disincentivise self-generation, self-consumption or participation in demand response. This clearly means that Member States are not permitted to

³⁵ Ofgem, *Electricity system flexibility* <https://www.ofgem.gov.uk/electricity/retail-market/market-review-and-reform/smarter-markets-programme/electricity-system-flexibility>.

³⁶ Schittekatte and Meeus, *Introduction to network tariffs*, above n 28, page 8.

December 2019

levy network charges that would discourage these activities or place other energy market activities at an advantage over self-generation, self-consumption or demand response.

2.6 Transparency

Article 18(1) requires that network charges be transparent. This could be reasonably interpreted as requiring that the methodology for tariff calculation and the tariffs themselves be accessible in a reasonably coherent format, to all market participants. This could include data on tariff calculation, how different classes of market participants are charged, as well as the underlying costs justifying the charges.

2.7 Time-differentiated (discretionary)

Article 18(7) provides that charges may, where appropriate, be time-differentiated to reflect the use of the network, in a transparent, cost-efficient and foreseeable way for the final consumer.

This is a discretionary matter for Member States, noting that if time differentiation is used, this should be in a transparent, cost-efficient and foreseeable way. Foreseeability can be taken to mean that from the energy users' perspective, adequate notification is provided regarding the charges that would be levied at different times.

2.8 Variable charging (discretionary)

Article 18(7) provides that charges may include network capacity elements and variable charging may include network connection capacity elements and be differentiated based on system users' consumption or generation profiles.³⁷

This discretionary provision does not offer significant guidance on the form of tariff design that Member States should adopt, but does highlight that Member States can use capacity-based and variable charges.

3 Analysis of how tariff categories meet Electricity Regulation requirements

The above requirements do not all easily align with one another; rather, a trade-off could be needed between the tariff type that would ideally satisfy one requirement in order to fulfil another requirement. This section 3 explains that tension by setting out how a high proportion of a particular tariff would satisfy or fail to meet the key design requirements in the Electricity Regulation set out in section 2.

³⁷ Electricity Regulation art 18(7).

December 2019

3.1 Example one: large fixed component

It could be difficult for a network tariff with a very high fixed charge component to meet the Electricity Regulation requirement for cost-reflectivity as interpreted in section 2. This is because applying a high proportion blunt charge to all energy consumers (or a class of consumers) irrespective of their level of grid use could fail to account for the specific costs a consumer imposes on the network.

Such a charge is also unlikely to meet other key Electricity Regulation provisions. As noted by the Council of European Energy Regulators, a fixed charge would likely discourage innovation in flexibility such as demand response activities.³⁸ A fixed tariff is also unlikely to give users signals about long-term costs.³⁹ It would therefore not encourage efficient network operation and development by DSOs, but rather encourage consumption at times of grid congestion or stress.

Fixed charges can therefore result in cost inefficiencies, by driving over-investment in underutilised grid infrastructure. This would be contrary to the Electricity Regulation provisions regarding efficient operation outlined in section 2. As a policy matter, given the need to decarbonise the transport and heat sectors in large part through electrification, high fixed charges could exacerbate the problem of underutilised grid infrastructure and increase the cost of the energy transition.

A caveat to the above analysis is that if fixed charges are made to be highly specific, they could be more likely to meet the CEP requirements. For instance, fixed charges could potentially be differentiated based on the size of household (that is, number of occupants and whether the residence is an apartment or a house), whether the household has PV and/or a battery, and based on its location. If that were done accurately and effectively, it could make fixed charges more reflective of the costs a consumer imposes on the network. And if the calculations were based on verifiable differences in the likely costs caused by the various consumer classes, it might be possible to avoid such charges being discriminatory.⁴⁰ However given the administrative complexity in designing such a charge, Member States might consider that its detractions outweigh its benefits.

As a policy matter, some experts hold the view that fixed charges may be appropriate for recouping certain network costs that are not recoverable through variable charges, namely residual network costs (that is, historical 'sunk' costs that cannot be changed).⁴¹ However, such an approach could

³⁸ See Council of European Energy Regulators, above n 6 at page 21.

³⁹ Ibid.

⁴⁰ In EU law, the principle of non-discrimination requires that like cases be treated in the same manner, so that the relevant entities are not at a disadvantage by comparison with others, without such differentiation being justified by the existence of substantial objective differences: Judgment of 23 October 2003 in *Changzhou Hailong Electronics & Light Fixtures and Zhejiang Yankon v Council*, T-255/01, ECR, EU:T:2003:282, paragraph 60.

⁴¹ T Schittekatte and L Meeus, *Limits of traditional network tariff design and options to move beyond* (September 2018)

December 2019

impede the energy transition in jurisdictions where networks are underutilised and have mainly, or all, residual costs. In such jurisdictions, using fixed tariffs to recover residual costs could result in very high fixed tariffs, which could be contrary to the other requirements of the Electricity Regulation for tariff design, such as supporting flexibility.

The table below sets out a summary of these points with colour-coding in red, yellow and green to indicate the level to which a large fixed tariff component would meet the listed Electricity Regulation provision.

Electricity Regulation requirement	Article	Comment
Cost-reflective and foreseeable	18(7)	Unless highly varied based on consumer class (not in current design), not cost-reflective. Highly foreseeable
Foster market integration, security of supply and innovation in digitalisation, flexibility and interconnection	18(2)	Unless highly varied based on consumer class, does not support integration of self-consumers or innovation
Long-term system efficiency	18(1), (8)	If not highly specific and cost-reflective, can discourage integration of innovative technologies and long-term efficiency
Short-term efficiency	18(8)	If not highly specific and cost-reflective, can discourage integration of technologies to improve short-term efficiency
Not disincentivise self-generation, self-consumption or demand response	18(1)	If not highly specific and cost-reflective, can disincentivise these flexible activities by failing to reward investment in new technology with better network pricing outcome
Transparency	18(1)	Depends on implementation and enforcement

3.2 Example two: large volumetric component

A network charge with a large volumetric component can meet many of the Electricity Regulation requirements, depending on the kind of volumetric tariff used, as explained below.

http://cadmus.eui.eu/bitstream/handle/1814/58564/RSCAS_2018_13.pdf?sequence=1&isAllowed=y, page 4. Network costs can be broadly classified into two categories – forward looking charges, which are those costs that can ostensibly be influenced by the future actions of network users, and residual charges, which are a lump sum of historical costs that cannot be changed: P Maltby, *What is fair? Network charging for our future electricity system* (30 April 2019) <https://www.regen.co.uk/what-is-fair-network-charging-for-our-future-electricity-system/>.

December 2019

A volumetric tariff can encourage integration of new market participants such as self-consumers, as such participants would be incentivised to save costs by reducing their demand for electricity.⁴² If a time-of-use element is also incorporated, this would encourage flexible behaviour such as demand response and use of household batteries, as these technologies could be used to reduce demand at times of grid congestion.⁴³

Time-of-use volumetric charging can, therefore, incentivise DSOs toward efficient operation and development of networks by reducing peak demand and avoiding overinvestment.⁴⁴ As noted in section 2, the Electricity Regulation stipulates that DSOs are not required to incorporate time-of-use network tariffs, but that where their Member State has deployed smart metering systems, they must consider using them.⁴⁵

An area where a volumetric tariff could fall short is with respect to cost-reflectivity. Volumetric charges can arguably be less cost-reflective than some capacity-based charges, because peak demand rather than the volume of electricity distributed determines the size of the network (and hence the investment costs). The Electricity Regulation requirement that network tariffs reflect 'actual costs incurred' would arguably be more likely to be met through volumetric time-of-use charges, with adjustments for any over- or under-charging made through redistribution mechanisms (such as taxation).⁴⁶ If the time-of-use element were dynamic rather than static (meaning that prices reflect more closely the actual peak use of a network) this would also allow more accurate cost recovery.⁴⁷ As such, the cost-reflectivity requirement might be able to be met through specific volumetric design.

As a policy matter and as noted in section 1, a high volumetric tariff component does present the risk of less adaptable consumers bearing higher network costs. This is because consumers who can afford to self-generate reduce their reliance on grid-supplied electricity, leaving others to cover network costs.⁴⁸

⁴² Council of European Energy Regulators, above n 6, page 22.

⁴³ L Lu and C Waddams Price, *Designing distribution network tariffs that are fair for different consumer groups* (October 2018) https://www.beuc.eu/publications/beuc-x-2018-099_designing_distribution_network_tariffs_that_are_fair_for_different_consumer_groups.pdf page 12.

⁴⁴ Time-of-use tariffs have been found to reduce use significantly during peak hours compared with tariffs that are not time-varying, but the effect is much stronger for households whose default tariff plan is time-of-use-based than households who need to opt-in: M Fowlie, et al, *Default effects and follow-on behavior: Evidence from an electricity pricing program* (2017) at page 280. Evidence from the US suggests that tariffs reflecting costs associated with peak demand, such as time-of-use tariffs, clearly increase total consumer surplus and that low-income households are responsive in the short-term to such tariffs (Wolak (2010), cited in L Lu and C Waddams Price, above n 43, page 34).

⁴⁵ Electricity Regulation, art 18(7).

⁴⁶ See, for example, Kolokathis, Hogan and Jahn, *Cleaner, smarter, cheaper*, above n 7, page 6.

⁴⁷ Council of European Energy Regulators, above n 6, page 22.

⁴⁸ This is particularly relevant where net metering is used, whereby energy-generating households are able to offset their volumetric consumption against their energy use. However, the Clean Energy Package limits the availability of net metering - see Electricity Directive arts 15(2)(e) and (4).

December 2019

If a high volumetric tariff is adopted, Member States may therefore need to consider mechanisms to prevent disadvantaged energy system users bearing a greater share of grid costs, or to provide compensation for those costs.

Member States should also note that time-of-use volumetric charges require smart meters.

As shown in the summary table below, if a volumetric tariff is adopted, one with a time-of-use element appears most likely to satisfy the Electricity Regulation requirements.

Electricity Regulation requirement	Article	Comment		
		Flat rate	Time-of-use	Critical peak
Cost-reflective and foreseeable	18(7)	Not directly cost-reflective; foreseeable with prior notice of prices	With dynamic design, can approach cost-reflectivity. Can be foreseeable with prior notice of prices	Cost-reflective; foreseeable
Foster market integration, security of supply and innovation in digitalisation, flexibility and interconnection	18(2)	Likely to support flexibility, and encourage new secure supply	Would encourage security, innovation in digitalisation, interconnection and flexibility	
Long-term system efficiency	18(1), (8)	If sufficiently cost-reflective, can support long-term efficiency by encouraging new market flexibility and innovation		
Short-term efficiency	18(8)	If sufficiently cost-reflective, can encourage integration of new technologies to improve short-term efficiency		
Not disincentivise self-generation, self-consumption or demand response	18(1)	Likely to incentivise self-generation and self-consumption	Likely to incentivise self-generation, self-consumption and demand response	Likely to incentivise self-generation, self-consumption and demand response
Transparency	18(1)	Depends on implementation and enforcement		

3.3 Example three: large capacity component

A large capacity component could meet some of the Electricity Regulation’s requirements, depending on the type of capacity tariff used, as explained below.

December 2019

In terms of cost-reflectivity, networks are built based on expectations of peak demand, which depends on both consumers’ contracted capacities and the estimated probability that they are simultaneously used at peak time.⁴⁹ Neither a contracted capacity nor an ex post charge is therefore entirely cost-reflective (but both will generally be more reflective than a volumetric or fixed charge).⁵⁰ However a capacity tariff is likely to be more directly cost-reflective than other tariff types.

Depending on whether a capacity charge is based on contracted capacity or is ex post, it can foster flexibility and energy efficiency in varying levels. A contracted capacity charge is likely to encourage consumers to try to reduce their overall consumption at the time the charge is set. Consumers could do this by, for example, purchasing generation and storage systems, which would allow them to reduce their peak capacity requirements. A contracted capacity charge would not, on its own, encourage flexibility and demand response at times of peak grid use, given the charge would be pre-set.

Theoretically, if consumers were equipped and willing to monitor prices, an ex post charge taking into account time of use could support flexibility by discouraging consumption at times of congestion by using demand response technologies.⁵¹ It could therefore align with the Electricity Regulation requirement to incentivise demand response and flexibility. However, as outlined in section 1, in practice it is difficult for consumers to sufficiently understand, monitor and engage in spot price calculations in order to benefit from these tariffs.

Furthermore, in terms of foreseeability, since the level of an ex post capacity charge is only known to consumers after using the relevant unit of electricity, it would be difficult to ensure such a charge would meet the Electricity Regulation requirement that time-differentiated tariffs be foreseeable for consumers. Such a charge would transfer significant cost risk onto individual consumers who might not respond to peak pricing.

Member States should keep in mind the following policy considerations in relation to capacity charges. First, the effectiveness of incentives offered by a high capacity charge component depends on consumers having smart metering. Second, as with volumetric pricing, vulnerable consumers who fail to change their consumption behaviour could be required to pay higher grid charges as an increasing number of flexibility-enabled consumers reduce their capacity requirements.⁵²

As shown in the summary table below, if a capacity tariff is adopted, one with an ex post element appears most likely to satisfy the requirements of the Electricity Regulation.

	Article	Comment
--	---------	---------

⁴⁹ Council of European Energy Regulators, above n 6, page 21.

⁵⁰ Council of European Energy Regulators, above n 6 at page 21.

⁵¹ L Lu and C Waddams Price, above n 43, page 11-12.

⁵² T Schittekatte and L Meeus, *Limits of traditional network tariff design*, above n 41, page 3.

December 2019

Electricity Regulation requirement		Ex ante	Ex post
Cost-reflective and foreseeable	18(7)	Cost-reflective to extent network costs determined by contracted peak capacity; foreseeable	Cost-reflective to extent actual use aligns with predicted use; not foreseeable
Foster market integration, security of supply and innovation	18(2)	Likely to support integration of self-consumers (including storage), innovation and encourage new secure supply (including storage)	Likely to support all aspects of ex ante as well as flexibility
Long-term system efficiency	18(1), (8)	By encouraging innovation, likely to support long-term efficiency	
Short-term efficiency	18(8)	Likely to encourage integration of new technologies to improve short-term efficiency	
Not disincentivise self-generation, self-consumption or demand response	18(1)	Likely to incentivise flexible activities by rewarding investment in new technology through flexible pricing	
Transparency	18(1)	Depends on implementation and enforcement	

3.4 Connecting Electricity Regulation requirements with current energy plans

The above analysis shows that different tariff designs achieve different ends in terms of the Electricity Regulation requirements.

In choosing between these tariffs and the broader options for tariff design, Member States should consider whether a combination of tariff types helps to address deficiencies in one particular tariff. For instance, RAP notes that a time-of-use volumetric combined with a critical peak charge has been shown to be effective in terms of consumer understanding and behavioural response.⁵³ In deciding on the appropriate design, Member States will of course need to take their local conditions into account, while being mindful of the legal requirements as well as the policy implications of their decisions.

⁵³ Jim Lazar and Wilson Gonzalez, *Smart Rate Design for a Smart Future* (July 2015) <https://www.raponline.org/wp-content/uploads/2016/05/rap-lazar-gonzalez-smart-rate-design-july2015.pdf> page 53.

December 2019

Member States should be re-considering their approach to tariff design in light of the CEP requirements. However analysis of draft National Energy and Climate Plans (NECPs) submitted by Member States under the Governance Regulation of the Clean Energy Package⁵⁴ indicates there is a failure to engage with issues around Electricity Regulation-compliant tariff design.

The EU-designated template structure for NECPs includes a requirement that countries describe measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing.⁵⁵ ClientEarth's review of the relevant provisions of the draft NECPs submitted by Member States shows that some have failed to engage with the request for information about such initiatives at all (Luxembourg), while many failed to expressly link dynamic pricing to flexibility initiatives. Others, such as Denmark, have more advanced plans for smart meter rollout and distribution network charging reforms.⁵⁶

Member States have the opportunity to better articulate plans for improving incentives for flexibility in their finalised NECPs, which are due by the end of 2019. NECPs are an important opportunity for Member States to outline their preferred approaches to meeting EU energy requirements, including the crucial question of how tariff design can best facilitate the transition to a decentralised, decarbonised electricity system.

4 Conclusion

The above analysis shows there is some tension between the network tariff design requirements of the Electricity Regulation. This legislative scheme reflects the inherent complexity of network tariffs, and the need for adaptation to specific energy market conditions. Member States and their relevant authorities will need to weigh up these requirements with their broader policy objectives and the overall CEP legislative scheme in order to determine the most appropriate tariff design for particular jurisdictions.

What makes an optimal distribution network tariff design is unsettled among technical groups and stakeholders, but there are broad themes in the debate. Namely, if a capacity charge is based on contracted load, it might dampen incentives for flexibility and so be opposed by those advocating

⁵⁴ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council [2019] OJ Series L 328/1.

⁵⁵ Governance Regulation, Annex I, clause 3.4.3. It is not clear whether this refers to dynamic electricity pricing (that is, pricing for unit of electricity used) or dynamic network pricing (relating to network charges and as discussed in this paper).

⁵⁶ Denmark's Draft Integrated National Energy and Climate Plan under the Regulation of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action (December 2018) https://ec.europa.eu/energy/sites/ener/files/documents/denmark_draftnecp.pdf, pages 50 and 69-70.

December 2019

for an accelerated shift towards decentralised, renewables-based energy systems. On the other hand, high volumetric components with no time-of-use component can fail to directly reflect grid investment costs.

While the Electricity Regulation permits a degree of differentiation in approach, certain tariff designs may not meet key requirements of the EU legislation. In particular, it appears that in order to comply with the Clean Energy Package's Electricity Regulation requirements, any fixed component should be limited, due to the difficulty in tailoring fixed tariffs to promote economic efficiency and flexibility. In addition, a high contracted capacity charge might fail to foster flexibility as required under the Electricity Regulation. A large volumetric component incorporating time-of-use elements is more likely to encourage flexibility while allowing greater cost-reflectivity.

Member States should have regard to these considerations in their tariff design decisions. The level of engagement with tariff design questions in Member States' draft NECPs was generally low, indicating there could be ongoing internal debates on this issue.

The trend currently observed in some Member States toward higher contracted capacity components could impede the integration of flexible energy resources and fail to accord with the Electricity Regulation requirements. Member States in which this trend is occurring should therefore reconsider their approach in order to ensure it aligns with the CEP requirements.

December 2019

Charlotte Hanson
Lawyer (Australian Qualified)
ClientEarth
+44 (0)30 3050 5940
chanson@clientearth.org
www.clientearth.org

ClientEarth is a registered charity that uses the power of the law to protect people
and the planet.

ClientEarth is funded by the generous support of philanthropic foundations,
institutional donors and engaged individuals.

Beijing

1950 Sunflower Tower
No. 37 Maizidianjie
Chaoyang District
Beijing 100026
China

Berlin

Albrechtstraße 22
10117 Berlin
Germany

Brussels

3ème étage
1050 Bruxelles
Belgique

London

274 Richmond Road
London
E8 3QW
UK

Madrid

García de Paredes,
76 duplicado,
1º Dcha.
28010 Madrid
Spain

Warsaw

ul. Żurawia 45
00-680 Warszawa
Polska

ClientEarth is a company limited by guarantee, registered in England and Wales, company number 02863827, registered charity number 1053988, registered office 10 Queen Street Place, London EC4R 1BE, a registered international non-profit organisation in Belgium, ClientEarth AISBL, enterprise number 0714.925.038, a registered company in Germany, ClientEarth gGmbH, HRB 202487 HB, a registered foundation in Poland, Fundacja ClientEarth Poland, KRS 0000364218, NIP 701025 4208, a registered 501(c)(3) organisation in the US, ClientEarth US, EIN 81-0722756, a registered subsidiary in China, ClientEarth Beijing Representative Office, Registration No. G1110000MA0095H836.