

Targeted Charging Review: a consultation

Consultation

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Overview:

We are consulting on reviewing and changing some of the charges that electricity transmission and distribution network users pay for using the networks. We think that the current way the 'residual' charges are applied could lead to potentially detrimental differences in costs for different groups of consumers, and inefficient investment decisions resulting in increasing costs for consumers overall.

We are proposing a Significant Code Review (SCR) to consider:

- whether changes to the residual charges would be in the interests of consumers
- how residual charges could be changed to better promote the interests of consumers
- whether changes are needed to the current charging arrangements for smaller embedded generation (EG), and when any such changes should be implemented
- whether any changes to the residual charging arrangements are needed before the completion of our proposed SCR, and when any such changes should be implemented.

We are consulting now on proposed principles to guide us in carrying out an SCR, if we decide to do so after considering responses.

We are also setting out our views on some changes to network charges for storage for consultation, that we think would best be taken forward by industry.

Context

Ofgem is the independent energy regulator for GB, with responsibility for network charging. We are responsible for ensuring that the relevant charging methodologies are aligned with the objectives set out in industry codes, and that changes to these promote the interests of current and future consumers.

We began a review of the transmission charging arrangements for smaller Embedded Generators in 2016, and have published two open letters on this work (see below). We published a minded-to decision¹ for consultation on 1 March on Connection and Use of System Code (CUSC) modifications CMP264 and CMP265, which address some aspects of these arrangements.

As part of this work, we have identified some other aspects of network charging that we think should be reviewed. We think that the current 'residual' charges, some other charging arrangements relating to smaller embedded generation, and the current charging treatment of storage all have the potential to create distortions, adversely affect competition and increase costs for consumers. Additionally, we think the effect of residual charges could adversely affect particular groups of consumers.

In light of our aims of promoting competition and protecting consumers, we are:

- Proposing a Significant Code Review (SCR) to look at residual transmission and distribution charging, and some other specific aspects of network charges
- Setting out our views on some specific changes to network charges paid by storage, that we think would best be taken forward by industry.

We provide further context to this consultation in the Introduction chapter below.

Associated documents

Open letter: Charging arrangements for embedded generation, 31 July 2016

<https://www.ofgem.gov.uk/publications-and-updates/open-letter-charging-arrangements-embedded-generation>

Update letter: Charging arrangements for embedded generation, 2 December 2016

<https://www.ofgem.gov.uk/publications-and-updates/update-letter-charging-arrangements-embedded-generation>

¹ Embedded Benefits: Consultation on CMP264 and CMP265 minded to decision and draft Impact Assessment, 1 March 2017

<https://www.ofgem.gov.uk/publications-and-updates/embedded-benefits-consultation-cmp264-and-cmp265-minded-decision-and-draft-impact-assessment>



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Embedded Benefits: Consultation on CMP264 and CMP265 minded to decision and draft Impact Assessment, 1 March 2017

<https://www.ofgem.gov.uk/publications-and-updates/embedded-benefits-consultation-cmp264-and-cmp265-minded-decision-and-draft-impact-assessment>

Smart, Flexible Energy System – a call for evidence, 19 November 2016

<https://www.ofgem.gov.uk/publications-and-updates/smart-flexible-energy-system-call-evidence>

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Executive Summary

Charging for electricity networks

The larger electricity transmission and distribution networks in GB are regulated monopolies². They operate under price controls set by Ofgem. These determine the revenues that these companies are allowed to recover in any given year. Network companies recover these revenues from network users, including generators and supply businesses, by charging for connection to and use of their system. The use of system charges include 'forward-looking' charges designed to incentivise the efficient use of the network, and 'residual' charges which are top-up charges set to ensure that total allowed revenues are recovered.

The Targeted Charging Review

The Targeted Charging Review is our proposed approach to reviewing some aspects of network charging. We are proposing a Significant Code Review (SCR) to consider:

- whether changes to the residual charges would be in the interests of existing and future consumers
- how residual charges could be changed to better promote the interests of consumers
- whether changes are needed to the current charging arrangements for smaller embedded generation (EG), and when any such changes should be implemented
- whether any changes to the residual charging arrangements are needed before the completion of our proposed SCR, and when any such changes should be implemented.

We are consulting now on proposed principles to guide us in carrying out an SCR, if we decide to do so after considering responses.

We are also setting out for consultation our views on changes to some network charges paid by storage operators, that we think would remove some disadvantages for storage relative to its competitors. We think these changes would best be taken forward by industry.

² Independent Gas Transporters (IGTs) and Independent Distribution Network Operators (IDNOs) are regulated through relative price controls set by reference to the charges of the regulated networks to which they connect.

How this work fits within our wider work programme

This consultation fits within a wider programme of work we are currently progressing. In our draft Forward Work Programme³, we set out a proposed programme of work to help facilitate the transition to an energy system where the way in which energy is produced, generated, transported, stored and supplied to consumers is changing.

The drive to reduce carbon emissions and the deployment of new technologies means the energy system is in transition to one that is lower carbon, more decentralised and more dynamic and responsive. These changes are presenting both challenges and opportunities for the energy system. If they are harnessed to develop a more flexible and efficient system, then consumers will benefit from an affordable, secure and responsive market now and in the future.

These changes are challenging the regulations and market rules that govern industry. Arrangements that were designed for a system with passive demand and large-scale, centrally-dispatched power stations will need to evolve. It is Ofgem's role to make sure these arrangements remain fit for purpose under a range of future outcomes. Our proposed review is an important part of this broader programme of work.

Residual charges and our proposed principles

'Forward-looking' network charges are designed to incentivise the efficient use of the network, and are designed to reflect network users' impact on network costs, including current and future investment costs. Residual charges⁴ are 'top up' charges set to ensure that the network's efficient costs can be covered, after other charges have been levied.⁵

Any charge will potentially encourage some network users to take action to reduce the amount they pay. For forward-looking charges that broadly reflect the costs the user imposes on the network, this is a positive effect. If someone can pay less to locate a new generator on a part of the network where the costs he will impose on the network are lower, then both that user and the network save money.

Residual charges are intended for revenue recovery, and are not meant to incentivise specific actions by network users. As the system evolves, any residual charge will have some potential for some users to respond by changing their behaviour. To the extent that users do respond to them, there could be additional costs for the system,

³ Ofgem's Draft Forward Work Programme, 2017-18, chapter 2
<https://www.ofgem.gov.uk/publications-and-updates/draft-forward-work-programme-2017-18>

⁴ For the purpose of this document, 'residual charges' refers to the transmission residual charges, and 'scaling' in DUoS charges.

⁵ We are separately considering what changes may be needed to forward-looking network charges as part of a broader question about how best to incentivise efficient use of the entire electricity system. We are taking this forward as part of our joint work with BEIS on a smart, flexible energy system and development of our own future-focused programme of work on market and regulatory arrangements for the future energy system.

but there could also be incidental benefits from this response. However, because residual charges are set to recover a given amount of money, if some users pay less, all other users will pay more.

Our principal objective is to protect the interests of existing and future electricity consumers. We are also required by law to have regard to a range of other considerations when carrying out our functions, including consumers in vulnerable situations, sustainable development, the ability of companies to finance their activities and the principles of better regulation. In proposing an SCR, we have thought about how we can reflect our principal objective and statutory duties in assessing potential changes.

We consider that a key objective of residual charging should be the reduction of distortions which arise from the charges. Given it is impossible to entirely avoid distortions from these charges, the challenge is therefore to find a way of setting residual charges that, to the extent they do influence users' decisions, they do so with positive effects on consumers' wider interests, or at least less harmful ones.

In seeking a better system, we will also need to have regard to the potential impacts on users, particularly those on consumers in vulnerable situations. More widely than that, any new system should lead to a distribution of charges between users that is considered fair. We recognise that different people will have different views on what is fair, and if we proceed with the SCR we will seek to understand these views in assessing which options meet this principle.

We are therefore consulting on principles that we propose to adopt in assessing various different options. We are proposing that these should be:

- reducing distortions;
- fairness; and
- proportionality and practical considerations.

We are also seeking views on whether the allocation of residual charges between classes of users should change in future, and in particular if the balance of residual charge recovery between generation and demand should be changed.

Charging arrangements for smaller embedded generation

Generation (and storage) that is smaller than 100MW and connected to a distribution network ('smaller EG') faces different charges from larger EG and transmission-connected generation. In principle, these 'embedded benefits' have the potential to distort competition, and to distort generation developers' decisions about what to build and where to connect. These benefits include the way that smaller EG are treated for Balancing Services Use of System (BSUoS) charges.

We have consulted on a minded-to decision on proposed changes to the Transmission Demand Residual (TDR) element of these arrangements. We are planning to reach a final decision on these changes in May. We will take account of that decision in this proposed work. In this consultation we set out the other elements of embedded benefits that we propose to consider in the SCR.

We are consulting on a Significant Code Review

The Significant Code Review (SCR) process provides a vehicle for Ofgem to initiate wide-ranging and holistic change and to implement reform to code based issues. SCRs can be used to provide top-down solutions for cross-code issues such as those with our electricity network charging framework. Potential changes to residual charges and charges for smaller EG could have a significant impact on electricity consumers and require cross-code changes.⁶

We are therefore consulting on carrying out a SCR to assess options for residual charges, and to consider the current charges for smaller EG.

Charging arrangements for storage

Storage connected to the transmission network currently pays transmission demand charges when it takes electricity off the network (during Triad⁷ periods), and generation charges when it reconverts the stored energy to electricity and supplies it back. These charges include transmission residual charges for both demand and generation.⁸

Storage connected to the distribution network currently also pays demand charges and generation charges. Storage connected to the distribution network currently pays demand residual ('scaling') charges. There are currently no distribution generation residual ('scaling') charges. Smaller storage (below 100 MW) can also receive embedded benefits when it generates.

We think it is appropriate for storage to pay the 'forward-looking' charges that reflect the future costs that incremental demand and incremental generation impose on networks. However, we do not think it is appropriate for storage to pay both demand and generation residual network charges. This places storage at a relative disadvantage to generators providing similar services to suppliers, consumers and network operators.

We think that storage should be treated as generation for the purpose of setting all residual charges, and so should not pay demand residual charges for either transmission or distribution.

Transmission-connected storage and distribution-connected storage above 100 MW pays both demand and generation BSUoS charges. This also places storage at a relative disadvantage to generators providing similar services. We think storage should not pay these two charges. We are consulting on two ways of reducing BSUoS costs for these types of storage.

⁶ We expect the TCR to affect the BSC, CUSC and DCUSA.

⁷ The Triad refers to the three half-hour settlement periods with highest system demand between November and February, separated by at least ten clear days.

⁸ Tables 3, 4 and 5 in chapter 8 set out in more detail how network charges apply to storage.



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We currently consider that if, following the consultation, there is a clear way forward on charges for storage, these changes should be taken forward by industry.

1. Introduction

The purpose of this consultation

1.1. The purpose of this consultation is to set out the proposed scope and approach for a targeted review of a number of electricity network charging issues, herein referred to as the Targeted Charging Review (TCR).

Charging for electricity networks

1.2. The larger companies that own and operate electricity transmission and distribution networks in GB are regulated monopolies. They operate under price controls set by Ofgem⁹. These determine the revenues that these companies are allowed to recover in any given year.

1.3. These revenues cover the efficient costs of running the network, plus a rate of return on regulatory assets. They are set at a level that allows efficient network companies to finance their activities, consistent with Ofgem's statutory duties.

1.4. Under the current price controls, which will remain in place to 2021 for electricity transmission and 2023 for distribution, the revenues network companies are allowed to recover in a particular year are broadly fixed. In particular, network companies are not exposed to variations in volumes of electricity distributed or the number of users connected. At present the risk of stranded or under-utilised assets is borne by the users of the network and hence by energy consumers.

1.5. Network companies recover these revenues from network users, including generators, storage and supply businesses, by charging for connection and use of the system. Total electricity network use of system charges in Great Britain are currently around £8bn per annum and represent around a quarter of the cost of a typical household electricity bill, or roughly £130 per annum on average.

1.6. Network charges are set at a level that is forecast to recover the companies' revenue allowances. Because this is broadly fixed for each year, if some users pay less, others will have to pay more to make up the difference. Also, under-recovery in a given year can be recouped through higher charges in the following year.

⁹ The IDNOs and IGTs are governed by Relative Price Controls set by reference to the price controls of the network companies to which they connect.

1.7. Some network charges are designed to incentivise the efficient use of the network. In general, these 'forward-looking' charges are set to reflect network users' impact on network costs, including current and future investment and reinforcement.

1.8. These charges include zonal transmission charges and the time-of-use based elements of distribution charging, and are designed to reflect forward-looking cost drivers. For example, by charging more in some zones, locational transmission charges are designed to discourage generators from connecting where their activities are likely to drive future network investment.

1.9. However, these forward-looking charges are generally insufficient to recover the revenues network companies are entitled to under their price controls. The balance of revenues is recovered through residual charges, which are designed to 'top-up' revenues to the allowed level.

1.10. Residual charges currently represent the majority of transmission charges (around 80%). At distribution level, they vary between different Distribution Network Operator (DNO) areas, and can be up to half of the distribution network charges.

1.11. BSUoS charges recover the cost of day to day system operation of the transmission system. Generators and suppliers are liable for these charges, which are calculated half-hourly as a rate per kWh across both demand and generation users. Although BSUoS is not a top-up charge which is applied after other charges have been levied, it is similar to a residual charge since it is not currently designed to drive forward-looking behaviour. In future, BSUoS may be changed to introduce incentives to influence forward-looking behaviour.

Table 1: Residual network charges

| 2017-18 | Residual/scaling charges | Total network charges |
|---|---------------------------------|------------------------------|
| | £million | £million |
| Transmission generation | 32 | 453 |
| Transmission demand | 2,258 | 2,255 |
| Aggregate distribution charges ⁱ | 1,437 | 5,235 |

ⁱThese are the vast majority of distribution network charges. Users connected to a distribution network at the Extra-high voltage level pay an additional c£150m in distribution network charges.

Residual charges

1.12. The main focus of our proposed review is on the means of recovering residual network charges from network users.

1.13. We consider forward-looking network charges to be part of a broader question about how best to incentivise efficient use of the entire electricity system, taking account of whole system costs and benefits. Ofgem is taking forward this broader issue as part of our joint work on a smart flexible energy system with BEIS and our own strategic review of market and regulatory arrangements in the light of changes to the energy system.

1.14. Residual charges are intended for revenue recovery, and are not meant to incentivise specific actions by network users. To the extent that users do respond to them, there could be additional costs for the system, but there could also be incidental benefits from this response. Any responses could affect the overall development of the system, as well as the distribution of charges between parties. We will need to consider the wider impacts on consumers' interests of likely responses to charges, and aim to design charges that are more likely to lead to positive effects on consumers' wider interests, or at least to less harmful ones than would be likely under other options.

1.15. Any method of residual charging is likely to incentivise users to reduce their exposure to those charges to some extent. Hence completely non-distortive recovery of residual charges is not practically possible. For example, a single fixed annual charge could encourage some users to disconnect from the electricity network altogether, even though they may prefer to stay connected for a lower residual charge. Hence a more realistic objective is to derive residual

charges on a basis that will reduce distortions rather than eliminate them altogether.

1.16. Any change to residual charging is likely to have an effect on the relative incidence of network costs between different generators. Different types of generation receive different levels of support under Government policies. In reviewing charges, it is not our intention to set charges that add to that support, nor effectively reduce it. We are seeking a system of charging that does not unduly discriminate between different users, whether generation or demand.

Proposed principles for residual charge recovery

1.17. Given these challenges with setting residual charges, how should we decide the best means of recovering residual charges?

1.18. As with all of Ofgem's regulatory decisions, we are guided by our principal objective and statutory objectives. In the case of network charging we will also take appropriate account of the objectives of the specific code bodies that cover network charging. These objectives stress the importance of cost-reflectivity, facilitating competition and reflecting developments in the network businesses. Cost-reflectivity is less directly relevant for residual charges; however, it is important that residual charges do not unduly distort the signals provided by the forward-looking charges which are intended to be cost-reflective. Facilitating competition can be achieved by residual charges which do not provide undue advantages to any particular set of network users, and hence facilitate effective competition between network users.

1.19. Our principal objective is to protect the interests of existing and future electricity consumers. We need to have in mind our principal objective in determining the best way of setting charges. For example, a means of revenue recovery that results in actions by network users that do not add value to the system, but significantly increases costs for consumers, is unlikely to be consistent with our principal objective.

1.20. We are also required by law to have regard to a range of other considerations when carrying out our functions, including consumers in vulnerable situations, sustainable development, the ability of companies to finance their activities and the principles of better regulation.

1.21. We set out our proposed principles in chapter 5. They are focused on reducing distortions, fairness, proportionality and practical considerations.

Fairness and practical considerations

1.22. We need to recognise that electricity is an essential service, and notions of equity and justice are important, particularly when it comes to charging for a monopoly service. Charges should not unduly discriminate between classes of users without good reason and should comply with common notions of fairness.

Stakeholders may perceive it as unfair if certain users are able to reduce their charge without providing a clear benefit, recognising that not all benefits are cost related. We recognise that different people will have different views on what is fair, and if we proceed with the SCR we will seek to understand these views in assessing which options better meet this principle.

1.23. It is also important to have regard to distributional effects when making choices between different approaches to charging. Given residual charges are broadly fixed, any changes are likely to reduce charges for some and increase charges for others. In making choices it is important we have regard to vulnerable consumers. We may also need to consider the case for transitional arrangements where changes for individual network users would be large and sudden.

1.24. A decision about which approach to residual charging best meets Ofgem's principal objective and statutory objectives is likely to involve deciding which approach causes the least harmful distortions. It is difficult to make such a decision without a view about the range of possible future developments, which are increasingly uncertain given the pace and extent of technological and market change.

1.25. In seeking a new approach, we also recognise that some people might consider some distortions to investment preferable to others of equal size – perhaps in relation to low-carbon compared with high-carbon generation technologies. If we carry out an SCR, we will seek to understand the different views on which distortive effects might be more or less harmful to the system and to current and future consumers' interests.

1.26. In that context, it is important that any decision we make is rooted in practicality and recognises that we are making this assessment under uncertainty about the future evolution of the energy system. We recognise the value of a stable, predictable regulatory framework, and consider that taking a principles-based approach to this review will help to inform network users about the likely range of outcomes. We also recognise that any approach we adopt may need to be adapted in future if changes in technology or market conditions significantly change the way network users respond to these charges. However, we think the principles we are proposing should be relevant to future considerations of these issues.

1.27. Finally, it is important to consider practicalities in choosing a charging methodology, including the availability of the required metering information, implementation cost and simplicity.

1.28. In proposing an SCR, we are not prejudging a decision to change residual charges, at either transmission or distribution level. We think there is likely a better way to set these, but we will need to consider options thoroughly. Following consultation on our approach including our principles, and after assessing the evidence on how possible new charging systems would meet our

principal objective, the Code objectives and our principles, we may conclude that change would not be in the interests of current and future consumers.

Link to our minded to decision on CMP 264 and CMP 265

1.29. On 1 March we published our minded-to decision on CMP 264 and 265 to change the TDR arrangements that lead to large payments to smaller EG, for consultation.¹⁰ Following consultation, we will decide whether to confirm this decision, or to accept one of the other modifications submitted to us, or to reject all of these modifications and consider the TDR payments further through this review. We plan to make this decision in May, and the scope of the TCR will reflect this decision.

Other benefits for smaller EG

1.30. We think that the charging arrangements for smaller EG, compared with larger EG and Transmission-connected generation (referred to as 'embedded benefits'), are creating distortions in incentives over where to locate generation, the size of generation to build, when to operate it and the prices asked for operation (compared with alternative generation providers). We are already consulting on some specific changes to one element of these arrangements, and are now seeking views on taking forward work on the other elements in the proposed SCR.

Proposed changes to residual and BSUoS charging for storage

1.31. We have already consulted on the charging arrangements for storage through the recent call for evidence on a smart/flexible energy system¹¹, so we think that some changes should be taken forward in this area ahead of the completion of the rest of the TCR. We think that the way charges affect storage at present create a relative disadvantage for storage operators, in comparison with generators connected at the same voltage level. This is because storage is liable to pay both demand and generation residual charges, and because transmission-connected storage pays BSUoS as both demand and generation. In order to secure a more level playing-field, we think that storage should be liable to pay only the locational demand and generation charges, the generation residual charges, and one set of BSUoS charges.

¹⁰ The proposed change would move TDR to gross metering of demand at the grid supply point (GSP), thereby removing the ability of smaller EG to get paid for helping suppliers avoid TDR charges, and put in place a payment for avoided GSP costs. Embedded Benefits: Consultation on CMP264 and CMP265 minded to decision and draft Impact Assessment, 1 March 2017 <https://www.ofgem.gov.uk/publications-and-updates/embedded-benefits-consultation-cmp264-and-cmp265-minded-decision-and-draft-impact-assessment>

How we propose to make these changes

1.32. We are consulting on specific changes for storage that we think could be taken forward relatively quickly by industry. On the others, we think further work is needed and we propose to cover residual charges and other embedded benefits in a Significant Code Review.

1.33. However, if we conclude that there are significant distortions in the current system, and that waiting to take action until the TCR is completed and implemented would likely lead to significant costs to consumers, we will consider taking early action to address these issues, such as specifically exempting one or more code modification proposals so that they could proceed through the standard industry process.¹²

Guide to the rest of this consultation document

1.34. The main focus of this review will be on residual charges. We are proposing a full review of how the Transmission Network Use of System (TNUoS) and Distribution Use of System (DUoS) residual charges are set.

1.35. In chapter 2 and Appendix 1, we explain how the network charges are set, and how we think distortions arise under the current system of residual charging. Chapter 3 gives some examples of how this might occur, and the potential effects on some groups of consumers.

1.36. We include in chapter 4 a description of how this problem has been addressed in other jurisdictions. Other regulators have taken different approaches, and there is no clear consensus yet among industry experts on a single way to set these charges. However, we think there is evidence that indicates that the current GB approach can be improved.

1.37. In chapter 5, we set out relevant economic thinking about residual charges. In light of this and other considerations, we set out our proposed principles for assessing options for setting residual charges, if we conclude that these should change. We propose to use these principles, adjusted as required following this consultation, in considering the merits of different options.

1.38. In chapter 6, we set out some initial high-level options that could be considered for GB. We are seeking views on these options, and on any others that might be pursued, including any specific adjustments that you think would be appropriate to any of them.

¹² If we launch an SCR, new modification proposals, which cover similar ground to the SCR, may not proceed through the standard industry modification process, unless these are urgent or specifically exempted by us.

1.39. In chapter 7, we set out the charging arrangements for smaller EG that are different for other generation, and some considerations that we think apply in reviewing these. We are seeking views on whether we should review these in our proposed SCR, and on the relative priority of any changes to them.

1.40. In chapter 8, we set out the network charges that currently apply to storage, and our views on how changing some of these would address disadvantages for storage in comparison with generators. We are seeking views on these. We think that these changes can be taken forward by industry, rather than waiting for the conclusion of the SCR, if we decide to carry one out.

1.41. In chapter 9, we set out our proposed approach to taking forward work on any changes covered by this consultation document, and ask for views on this.

2. Why we propose to review residual network charges

Chapter Summary

Our proposed review will focus on the residual charges for the transmission and distribution networks, and specific aspects of charging arrangements for smaller EG. Residual charges are the top-up charges which ensure network companies can recover their allowed revenues once other charges are levied. They do not recover a specific set of costs, but they relate to the 'joint' or 'common' costs of the existing networks that can't be attributed to individual users' usage of the network.

The current way that residual charges are set creates some incentives that could lead to a more expensive system overall. Additionally, residual charges are set to recover a given amount of money, and so if some users pay less, others pay more. The way these charges are currently set means that the distribution of network costs between different users may change significantly, and there is a risk of material cost increases for some consumers as a result. We think that residual network charges should be set differently in future to reduce distortions, and so that everyone pays a fair contribution.

Question 1: Do you agree that the potential for residual charges to fall increasingly on groups of consumers who are less able to take action than others who are connected to the system, is something we should address?

Question 2: If so, why do you think, or do not think, action is needed?

Question 3: We are proposing to look at residual charges in a Significant Code Review. Are there any elements of residual charges that you think should be addressed more urgently? Please say why.

Background

2.1. Electricity network 'use of system' charges include the TNUoS and BSUoS charges for the transmission network and DUoS charges for the distribution network. TNUoS and DUoS charges are broken down into two elements - forward-looking charges and residual charges (sometimes referred to as cost recovery charges). The proposed review focuses on the residual charges.

2.2. For the purposes of this review we are using the following definitions:

- 'forward-looking' charges which aim to reflect current and forward-looking costs associated with generating or consuming energy. For some but not all users, these can vary by location on the network, or by time of use.

- 'residual' charges are the 'top up' network charges which ensure network companies can recover their allowed revenues once other charges are collected. These charges do not specifically recover particular network costs, but relate to the 'joint' or 'common' costs of the existing networks that can't be attributed to individual users' usage of the network. These are the TDR, Transmission Generation Residual (TGR) and Distribution Network Use of System (DUoS) 'scaling' charges. Similarly, BSUoS charges are not set by reference to the balancing costs related to an individual users' use of the network.

2.3. 'Forward-looking' charges reflect the current and forward-looking costs that an incremental increase in network use - either generation or demand - would impose on electricity networks. They should therefore provide signals to network users to encourage them to use the network efficiently (ie to minimise the costs that result from their network usage). They should help to encourage network users to make efficient decisions in where they locate, the voltage they connect at and when they use the network. Economic theory indicates that users will make the most efficient decisions about where, when and how to use the network when they are facing the incremental or marginal cost of their behaviour.

2.4. However, charging based on incremental/marginal costs only will not allow network owners to recover all of their costs. A large proportion of network costs are fixed and sunk costs which have already been incurred. They include the costs of the existing network, which network owners recover over the life of the assets.

2.5. Residual charges don't relate to any specific set of costs, but they recover the rest of the allowed revenues not recovered through connection charges and forward-looking charges, and typically recover a large proportion of total revenues. For example, the amount recovered in residual charges for the transmission network is forecast to be £2.26 billion in 2017-18.¹³

2.6. These residual charges can distort the incentives given by the forward-looking charges, since:

- The forward-looking charges provide a signal about the costs of location, voltage level and use: users may choose to locate somewhere else, connect at a different level, or use the network differently, in order to reduce these charges - and these decisions in turn will reduce the future (or incremental) costs for the network operator; but

¹³ The residual charges on the distribution networks vary by DNO area. At present, the highest distribution residual charges are around 50% of the total distribution network charge.

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- Adding residual charges to these price signals changes them: it could reduce the relative difference between different locations, voltage or use choices; or it could amplify them.

2.7. Residual charges are intended for revenue recovery, and are not meant to incentivise specific actions by network users. To the extent that users do respond to them, there could be additional costs for the system, but there could also be incidental benefits from this response. Examples of additional costs include more investment in generation that is carbon-intense, or that has high per-kWh costs to operate; or network users may reduce the volume of energy they consume or the capacity of their connection below the level they would have used if they faced only marginal cost charges.

2.8. There is also an important effect on other users' residual charges. Reduced consumption by any individual user does not reduce the amount of revenue that needs to be recovered through residual charges. If one group of users pay less towards residual charges, the charges to other users increase to make up the shortfall.

2.9. Under the current system, we think that:

- Some users may make decisions based in part on the residual charges, and pay lower residual charges, although their actions have not reduced the level of costs which need to be recovered; and
- Other users will then pay higher residual charges, although their actions have not increased the level of costs that are needed to be recovered.

2.10. Economic theory suggests that to minimise distortions, residual charges should take account of users' likelihood to react to the type of charge being levied (ie the 'price elasticity'¹⁴ of different consumers in response to the price they face). The two factors here are the way that charges are designed and how different groups of users respond to the charges. The more likely any group of users is to react to a particular type of charge, the greater effect of the distorted incentive from these charges, as described above. This means that residual charges should be designed to minimise the likelihood that the charge itself changes the behaviour of any group of users who benefit from the system.

2.11. This is discussed in chapter 5 below, which also explains that we do not think reducing distortions should be our only aim in reforming residual charges.

2.12. Historically, GB charges were broadly aligned with the principle of taking account of price elasticity. The majority of residual charges have been paid by

¹⁴ Price elasticity of demand is a measure of the responsiveness, or elasticity, of the quantity demanded of a good or service (by a consumer or group of consumers) to a change in its price

demand users, and charges have been levied on relatively inelastic elements of demand and generation.

2.13. For most smaller customers (eg domestic and smaller commercial users), residual demand charges are largely based on final net consumption (the total amount of energy they import from the Grid, which is their gross consumption less any generation produced within their premises). For larger customers, transmission demand residual charges are levied based on their use of the network at peak times (included within the 'Triad charges'), and distribution charges are based either on the capacity of their connection and/or on the volumes used at different times, depending on the voltage level of connection. Generators connected to the transmission system are charged generation residual charges based on their Transmission Entry Capacity (TEC). In most of these cases, the bases for these charges have been things that historically most consumers were not expected to change in response to these charges.

2.14. The increase in availability and affordability of smaller scale generation (and in future, potentially storage) means that some consumers can more easily reduce their net demand, or their peak net demand, and more are likely to be able to do so in future. Residual charges levied on net demand or peak net demand will fall more on users who do not have these technologies. This could lead to potentially adverse distributional effects.

2.15. One example of adverse effects from the current charging system is the impact of the TDR arrangements, where smaller EG receive payments resulting from the way TDR charges are levied. As set out in our open letters of July and December 2016, and our minded-to decision in March 2017, we think this is increasing the costs that are recovered from consumers. In those letters we also noted that there are other issues with residual charging, which could lead to similar effects.

2.16. We think that if the residual charging system does not change, residual charges will increasingly fall on those users who are not able to invest in their own generation and storage. We are looking to explore other ways to set these charges, that could mitigate this effect.

2.17. In reviewing these charges, our initial view is that all users who are connected to the licensed networks should make some contribution to common costs. We are not making any assumptions about how much users with generation behind the meter, or any other type of user, should be paying, beyond this initial view.

Possible earlier changes

2.18. We are proposing to look at residual charges and some aspects of charging for smaller EG in a Significant Code Review. We think that an SCR is appropriate because it allows us to consider a number of important and interrelated questions, affecting more than one charging code, in a co-ordinated and consistent way.



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2.19. However, an SCR will take some time to conclude – at least 18 months, with implementation after that. If any stakeholder considers that any specific aspect of residual charges is having, or is likely to have, serious detrimental effects, and should be changed more urgently, we will consider that in deciding how to proceed.

3. How some network users may respond to the current residual charges

Chapter Summary

There is a range of ways that some network users, but not others, may pay much lower residual charges, with the effect that other users' bills go up. We are not seeking to prevent or discourage these new ways for people to manage their own electricity generation and consumption. We are concerned about the potential for higher residual charges to fall on other users who do not have the same options to reduce their payments of these charges. In any future system of charges, different groups of consumers might be affected by higher charges; we will need to understand this risk in considering any change to charges.

Background

3.1. This chapter provides an illustration of some network users who, under the current residual charging system, may pay lower charges than users who do not have the technologies or arrangements described. We are not seeking to change charges in a way that actively discourages any of these technologies or arrangements. A different residual charging system might have the potential for costs to shift in other ways between groups of users, depending on the basis of the charge and the technologies and arrangements developed in future.

3.2. As described in chapter 2, residual charges are not largely driven by demand volumes. Reduced consumption, or increased generation 'behind the meter', do not reduce the amount of revenue that residual charges need to recover at any point in time.

3.3. In addition, the current residual charges offer large savings for customers who install their own generation, or connect to private wire networks, as these reduce net consumption (the consumption of electricity after taking into account generation from behind the boundary point with the licensed distribution network). These savings for some users need to be offset by higher charges for other users.

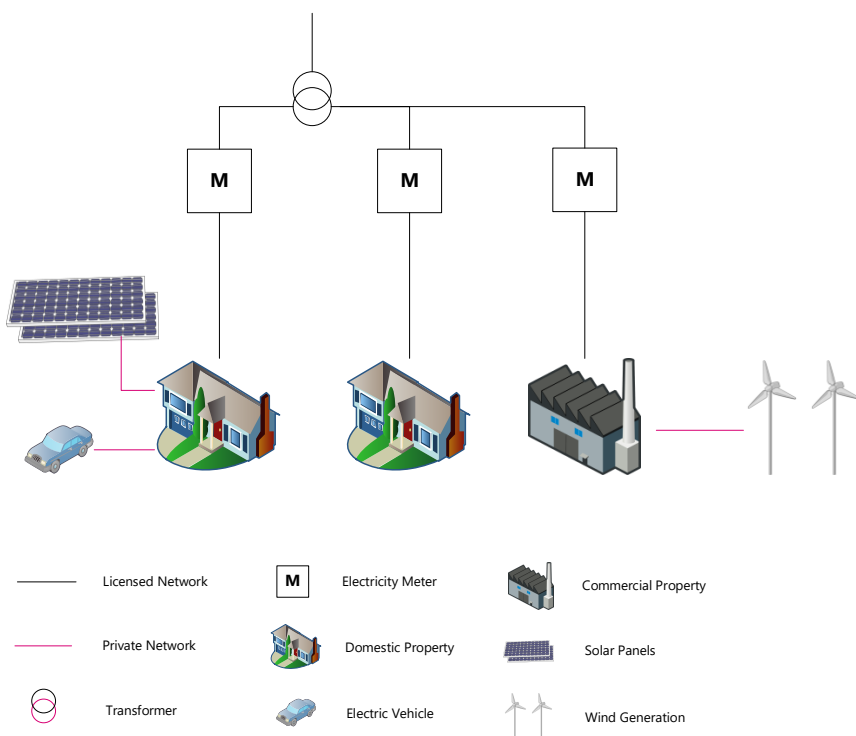
3.4. The current TDR charge is charged based on consumption at periods of peak system demand over winter. Collecting this residual charge based on net demand at peak creates an incentive to reduce demand at that time, including by using storage to 'shift' demand from one time of the day to another. This can provide benefits in the longer term in terms of reducing the need for future network expansion, but this does not reduce the amount of revenue that needs to be recovered from residual charges.

3.5. We describe behind the meter generation, private wires and home storage in more detail below.

How generation behind the meter affects residual charges

3.6. 'Behind the meter' generation refers to generation which is located beyond the point at which the customer's electricity use is measured, for example solar panels on a domestic property, or a backup generator installed at a factory. Generation from these sources has the effect of reducing the customer's metered consumption from the main network. Figure 1 illustrates this.

Figure 1: illustration of a home with generation and an electric vehicle, a home with neither, and a non-domestic premises with generation



3.7. Installing generation behind the meter can lower metered consumption during the periods at which residual network costs are recovered, leading to reduced residual network charges, which need to be offset by increases in other users' residual charges. If the size of the saving is large enough this may lead to an increase in the amount of behind the meter generation, and further increases in residual charges for consumers without it.

3.8. The way residual network charges are set may also influence the type of generation installed behind the meter. Controllable generation, such as a small diesel or gas generator on the site of a factory, is likely to have a higher marginal cost to generate than solar panels. If the residual charges are set on net consumption over a few periods per year (a time of use charge, like Triad) it is more likely that it will be worth turning on generation with a higher marginal cost at these times. Intermittent generation, such as a wind turbine, may not be

relied upon during these periods. Consumers with intermittent generation will pay lower residual charges if these are set by reference to total net consumption throughout the year.

3.9. If we confirm our minded-to decision to change the TDR arrangements for smaller EG, or make another decision which changes these arrangements, this will leave open the option of reducing TDR payments through behind the meter generation, as this will still allow users to combine demand with generation and pay reduced TDR charges.

3.10. There is evidence of a growing amount of generation locating behind the meter, although it requires a site with sufficient demand and space. For example, 1.4GW of 'unproven DSR' won Capacity Agreements in the CM auction in December 2016, of which we understand a significant portion is likely to include behind the meter generation.

3.11. We have no wish to prevent individual consumers and generators from taking their own decisions about how to manage their energy or make use of generation. However, the current residual network charges may distort decisions to install generation behind the meter, and as a result lead to higher residual charges for other users.

How private wire networks affect residual charges

3.12. Most electricity consumers in GB are connected directly to a licensed distribution network. These customers have a connection agreement with the distribution company and pay for the use of its system through their energy bills which include network charges.¹⁵ Each of these customers, whether they are a generator or demand user, will have a separate meter, which is used to identify their use of their network.

3.13. An alternative arrangement is for a customer, or group of customers, to connect to a 'private wire' network, which is then connected to a licensed distribution network through a single boundary point. These networks can meet the criteria to be exempt from holding a distribution licence, and are sometimes referred to as private wire networks. They can vary considerably in size and nature, from an international airport to a caravan park. Customers on these networks may be separately metered, but there may also be arrangements where there is a single meter on the boundary point with the licensed network. For the purpose of this consultation, we are referring to those networks with a single meter at the boundary with the licensed network.

3.14. Figure 2 shows how the majority of consumers are connected to the network, and Figure 3 illustrates a private wire arrangement.

¹⁵ For domestic customers, this agreement is included in their supply contract terms.

Figure 2: users on a licensed network

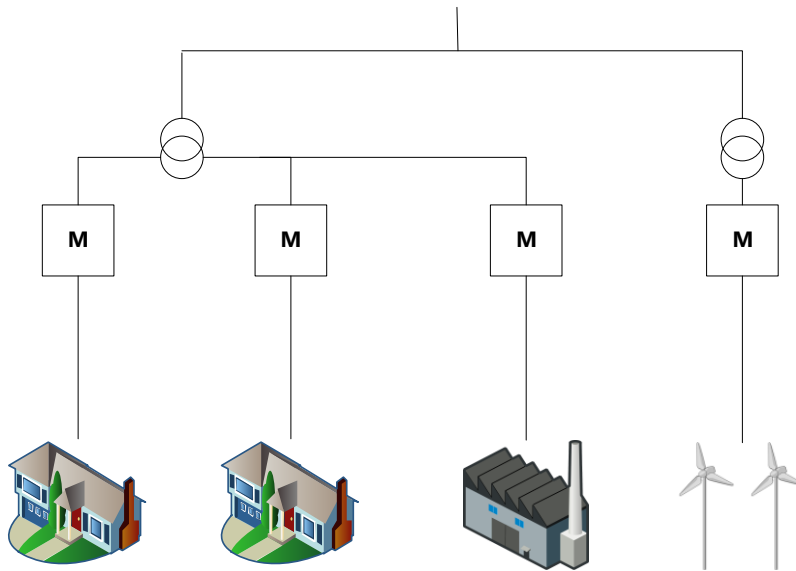
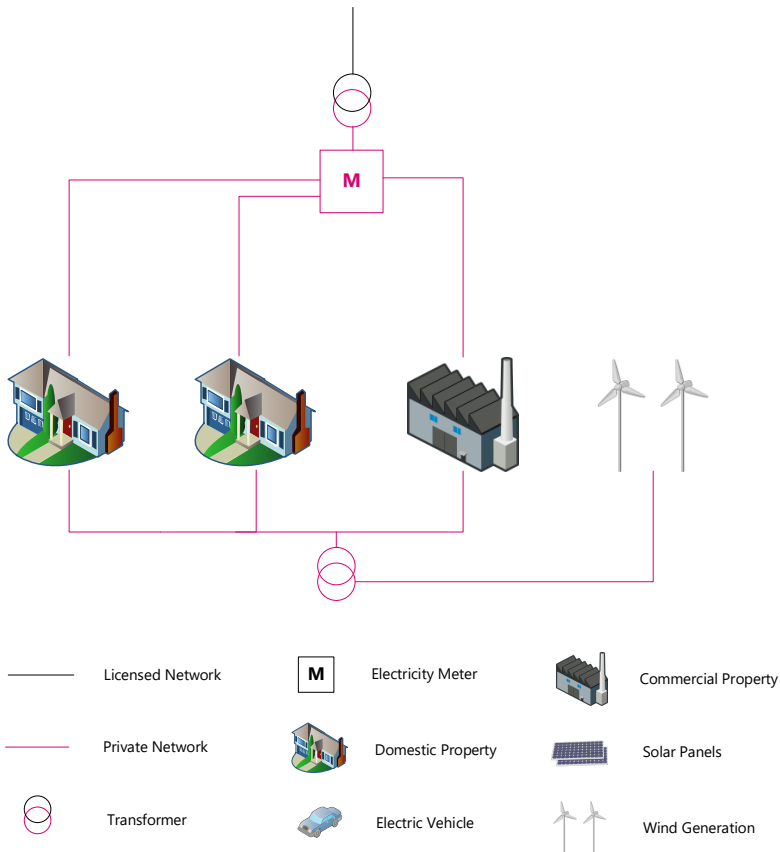


Figure 3: users connected on a private wire network



3.15. A private wire network also may have distributed generation connected directly to it. Some of this generation is likely to serve customers on the private network and therefore the net consumption, measured at the point of connection with the main network, will be lower than the total gross consumption of the individual customers. Charges for other consumers, connected directly to a licensed network, will increase in a similar way as with behind the meter generation.

3.16. There is already evidence that private wire networks are becoming more common. Lightsource, a solar energy company suggested last year that their future solar parks will all be connected via private wires: 'it is now only through its private-wire Power Purchase Agreements (PPA) offering that Lightsource is able to finance and develop utility-scale solar and energy storage solutions using land near to site – connecting them directly into the supply of major energy users such as factories, warehouses, data centres, transport hubs, leisure centres, chemical plants and water treatment facilities'.¹⁶

3.17. We have no specific concerns with the current licence exemption arrangements. Nor would we seek to prevent individual consumers, or groups of consumers and generators, from taking their own decisions about how to manage their energy use or generation.

3.18. However, we are not convinced that it is in consumers' interests for the reduction of residual network charges to drive these decisions. As noted above, the common costs of the network are not decreased by reducing the consumption of electricity from the main network, and so higher residual charges will fall on other consumers. Customers connected to private wire networks benefit from having the ability to call on the wider network whenever they need to do so, in the same way that users not connected to these networks are able to. However, under the current charging system, those connected to private wire networks will pay significantly less for the same ability to access the wider network than those connected directly to a licensed network.

How for storage behind the meter, including Electric Vehicles, affect residual charges

3.19. If the cost of storage equipment continues to fall, more consumers may choose to have their own storage behind the meter. This could be used to 'time-shift' the consumer's demand, for example by importing and storing electricity at low-demand periods and supplying it to the premises at peak times. This may be useful for a consumer with a supply contract that passes through within-day price variations.

¹⁶ <http://www.lightsource-re.com/blog/2016/01/08/lightsource-connects-23-new-ground-mount-solar-sites-in-one-month/>

3.20. Customers may also store electricity that is generated behind the meter, when this is more than is needed, and use it again when required. The customer would therefore be drawing less electricity from the network at certain times, paying lower charges for off-peak energy and use of the network. In the current residual charging system, this could also lead to a lower contribution to residual charges, for users whose charge varies by the time of network use.

3.21. Storage could also potentially be used as 'backup generation'. The value of this will depend on the user's needs, and the relative investment and running costs of storage and generation.

3.22. Electric vehicles can function as a form of domestic electricity storage. This may be the way that many smaller consumers come to own storage. If the car is connected behind the meter, it could supply electricity at certain times so that the consumer could buy at lower energy prices for use at times when they are higher (if these price variations are passed through). Similarly, if network charges vary according to the amount of congestion on the network at certain times, storage could be used to 'shift' network use to times when charges are lower.

3.23. A number of these developments could provide positive contributions towards smoothing energy consumption over longer periods of time, which could reduce future network investment costs; however, these do not reduce the amount of revenue that needs to be recovered from residual charges.

4. Experience in other countries

Chapter Summary

The question of whether residual charges should change has arisen in other countries around the world. We have looked at some where changes have been made. The approaches varied in different jurisdictions, suggesting that a bespoke solution may be appropriate in GB, if we conclude that change is needed.

Question 4: Are there elements of the approaches in other countries that you think could be appropriate for GB residual charges?

Question 5: Are there other approaches that you know about from other jurisdictions, that you think offer relevant lessons for GB?

Introduction

4.1. Economic theory, and the available academic literature, help to understand and describe some of the challenges associated with residual charging. It also provides concepts useful for considering the different possible options. However, there are equally useful lessons to learn from real-world experience of setting (and changing) network tariffs. We therefore carried out a review of recent international experience of residual charging¹⁷. This review aimed to:

- investigate whether other jurisdictions have identified similar issues
- develop an empirical knowledge base against which to test our understanding of the issues identified in GB
- understand what factors the relevant authorities considered when seeking to understand problems in their jurisdiction
- establish what approaches, if any, those jurisdictions took to address the specific issues they had identified
- understand, as far as possible, whether the chosen approaches successfully met their objectives and whether there were any other unanticipated consequences.

¹⁷ The full report has been published today on our website.
<https://www.ofgem.gov.uk/publications-and-updates/international-review-cost-recovery-issues-report-cepa-and-tnei>

4.2. Jurisdictions covered by our review were: The USA (California and Nevada), Australia (Queensland and Victoria), Italy, Spain and the Netherlands.

Findings – problem identification

4.3. Each of the jurisdictions reviewed has experienced problems with residual charges, and the relevant authorities took varying actions to address them.

4.4. The examples show that the drivers of cost recovery issues elsewhere are similar to those that we propose to consider in GB:

- Significant historical investment in networks to provide current levels of capacity and service.
- Arrangements being based on assumptions of steady or rising demand and customers using the network in predictable ways.
- Charging structures based on consumption (per kWh) charges; low fixed charges (where present); and net metering of consumption.
- Rapid technological change increasing the proportion of customers capable of generating electricity for their own consumption

4.5. One consequence of technological changes is the emergence of network users who are better able to reduce its net demand by producing electricity on-site. Traditional charging regimes (based on net demand) consequently recover lower residual charges from these customers.

4.6. The cases studied all highlighted the problem with residual charges calculated on net demand (or peak demand): reductions in net/peak demand by such customers does not reduce the overall level of charges which need to be recovered. This affects recovery of these network charges:

- In some jurisdictions, the result was a redistribution of charges away from customers with new technology towards those without. In Nevada, this was calculated to amount to a transfer of charges of between US\$9 and US\$114 a month from customers with EG to those without.
- In other jurisdictions the result was that network charges recovered from customers fell significantly short of the costs borne by the network companies. In Spain, under-recovery over a 15-year period has led to an accumulated 'tariff deficit' of €30bn.

Findings – policy options

4.7. There are clear differences between each of the jurisdictions reviewed and GB, with regards to market structure, charging regime design, and governance frameworks. Additionally, geographical and population density variations mean that the overall sums to be recovered by residual charges, and the effects on different groups of consumers, are likely to be different than that we expect in GB. But there are nevertheless useful lessons to be learned with regards to potential approaches to residual charges. There are also useful lessons on wider considerations needed for successfully delivering charging regime change of this kind. We summarise some of the options applied below.

4.8. **Gross kWh consumption:** consumers pay a price per kWh on total electricity consumed (including that provided by a consumer's own generation). This approach was taken in **Spain**. In this case, consumers with consumption and self-generation capacity over 10kW pay charges on the electricity they produce on their premises, alongside the electricity they receive from the grid. The rationale applied was that customers connected to the grid benefit from the guarantee of supply that this connection provides and should therefore contribute to the general costs of the system – in the Spanish case, these include historical investment costs, historical debt and renewables subsidies.

4.9. **Fixed price charge:** consumers pay a fixed fee for their connection to the grid independently of how much electricity they draw from the grid. The fee could be flat across all connected users, or set for each type or 'class' of consumers. **California** introduced a fixed US\$10/month charge per customer (even for customers with zero net consumption). In **Nevada**, customers already paid a fixed monthly charge (US\$12.75) which is set to be increased to US\$38.51 by 2028 with incremental increases phased over the 12 years.

4.10. **Fixed charges set by connected capacity:** consumers pay a fixed charge based on the size of their connection to the grid. In 2009 the **Netherlands** introduced a flat capacity charge (for distribution) for all domestic and small industrial consumers. This charge was based on the maximum power admissible by the customers' connection (fuse size is used as a proxy for this). The government considered that network charging needed to be made more consistent with the drivers of network costs. It took the view that network costs are mainly capacity driven and therefore that charges should be capacity based. The potential negative distributional affects for different customer types (and in particular for customers with very low consumption) were offset by changes to the tax regime resulting in a rebate to some consumers' energy bills. The changes have provided greater simplicity for network customers and better forecasting of network charges, as well as reduced income uncertainty for DNOs. Evidence suggests that incentives for energy efficiency have remained through other volume based elements of the bills.

4.11. **Hybrid approach:** consumers with particularly low, or particularly high, consumption pay charges on a different basis from the rest of customers. Distribution network operators in **Victoria, Australia** are proposing increased fixed charges for the residual element, but with some consumption-based charge

remaining. In this case, the new tariff structure is only applied to customers with consumption above 40 MWh/ annum. It is opt-in only for customers with annual consumption below this level. The increased fixed element is justified as signalling to customers 'the value of being connected to the network'. Similarly, **California** introduced a 'super-user surcharge' applying to approximately the heaviest 10% of users and **Italy** has different tariffs for households with contracted power capacity above and below 3.3 kW.

4.12. The approaches taken in the examples reviewed are not mutually exclusive and have, in some cases, been applied in combination. In **California**, for example, the fixed monthly fixed charge was introduced alongside gross import-based charges for certain 'non-bypassable' costs of the system. Equally, in some of jurisdictions, changes were also made to the cost-reflective elements of the network charge. In **Victoria** the cost-reflective element is to be charged on the basis of demand peak (£/kW). Others have taken separate measures to address apparent distortions, such as introducing mandatory time of use tariffs for EG customers or reductions to the rate paid to EG for exporting to the grid.

4.13. In most cases, changes have been introduced too recently to fully assess their long term impact. Among the longest standing, changes in the **Netherlands** (fixed charges set by capacity) have been in place since 2009. The switch to this tariff structure is generally considered to have achieved its aims. It has also been noted that concerns that a fixed charge would lessen consumer incentives to reduced overall consumption (and therefore incentives on energy efficiency) are not seen to have materialised because volumetric incentives from other elements of the energy bill continue to provide these incentives.

Findings – implementation and impacts

4.14. From the variety of approaches evident in the international examples it is clear that there are a range of potential alternative ways of recovering residual charges. While there are some common elements, such as a greater focus on fixed charges and/ or capacity rather than consumption, the approaches taken were specific to the jurisdiction in which they were applied. While these are instructive, we acknowledge that the approaches reviewed would not necessarily be directly applicable to GB. However, there are lessons that can be learned and applied to GB with regards to the implementation of the new tariff structures.

4.15. **Distributional effects.** Network residual charging is, in most cases, zero-sum because most charging regimes assume that the networks' allowed revenues will be recovered in full. Where changes are being made to address existing distortions (as in all of the examples in our review) there will inevitably be winners and losers. It is important that these effects are properly understood and considered when evaluating options for change. These were mitigated through a range of different approaches, from differential treatment for very low users in Australia to changes to the tax code in the Netherlands.

4.16. **Communications.** The examples highlight that good communication of changes is key to implementing them while reducing disruption. Industry parties

such as suppliers, as well as Ofgem, have a role in explaining any changes, and the reasons for them. Stakeholders need to be able to prepare in advance. There are some examples of successful engagements, particularly in the Netherlands where consumers had the option to change their fuse size for a reduced cost in advance of the new charges entering into force. The examples in Australia also demonstrate a strong focus on clear communication.

4.17. Transitional arrangements. International experience suggests that it may be appropriate to consider transitional arrangements to help ensure that consumers, industry and the network companies have appropriate time to prepare for the application of new charging structure. In relation to this review, we consider that consulting on and carrying out an SCR will give users considerable time to plan for changes and may reduce the need for delayed or phased implementation of any new arrangements. We will consider this issue in our proposed SCR, if we decide to carry it out following responses to this consultation.

4.18. Robust analysis. In-depth and impartial analysis of the options and impacts should underpin any changes. In particular, wider impacts of changes to reduce distortions should be taken into account and, where appropriate, mitigated. The international examples reviewed show that this is important, together with clear communication, for making change proposals which are practicable.

Summary – key lessons and considerations for GB

4.19. The international examples demonstrate that concerns with potential effects of residual charges are not isolated to GB. They also demonstrate that similar factors are driving concerns elsewhere (including high levels of historical investment and changing use of the network enabled by technological change).

4.20. The examples reviewed demonstrate that there are a range of approaches to residual charges. However, in a number of cases fixed charges, which do not vary with energy use, have been found to be an appropriate basis for residual charges. There is also some agreement that charges with greater focus on capacity may be less distortionary and more fairly collect network costs from different users than traditional arrangements have done.

4.21. Each approach identified has advantages and disadvantages – and thus requires a necessary trade off of objectives. This suggests that the goal should be to find a solution that better meets the principles we propose in chapter 5, subject to consultation responses, than the current arrangements.

5. Our proposed principles for assessing options

Chapter Summary

We have considered the relevant code objectives, our statutory duties and relevant academic literature in developing proposed principles to guide this review. We consider that we will need to keep a number of important principles in mind, and we are consulting on these.

Question 6: Do you agree that our proposed principles for assessing options for residual charges are the right ones? Please suggest any specific changes, or new principles that you think should apply.

Background

5.1. In assessing changes to charges, we are required to have regard to the objectives of the relevant charging codes which govern network charges, and to our statutory duties. These two requirements will set the framework for any decision we make. In considering the appropriate principles to guide this proposed review, we have considered the relevant code objectives, our wider statutory duties, our regulatory stances¹⁸ and relevant economic theory.

5.2. The relevant charging code objectives include cost-reflectivity, facilitating competition and reflecting developments in the network businesses. Cost-reflectivity is less directly relevant for residual charges; however, it is important that residual charges do not unduly distort the signals provided by the forward-looking charges which are intended to be cost-reflective. Facilitating competition can be achieved by residual charges which do not provide undue advantages to any particular set of network users, and hence facilitate effective competition between network users.

5.3. Our principal objective is to protect the interests of current and future electricity consumers. We need to have in mind our principal objective in determining the best way of setting charges. For example, a means of revenue recovery that results in actions by network users that do not add value to the system, but significantly increases costs for consumers, is unlikely to be consistent with our principal objective.

¹⁸ Our regulatory stances are summarised here: <https://www.ofgem.gov.uk/publications-and-updates/ofgems-regulatory-stances>

5.4. We are also required by law to have regard to a range of other considerations when carrying out our functions, including consumers in vulnerable situations, sustainable development, the ability of companies to finance their activities and the principles of better regulation.

5.5. Ofgem has also developed a set of 'regulatory stances', which include two aims that we think are particularly relevant to our proposed SCR:

- that all market participants should compete on a level regulatory playing field, on cost and non-cost issues;
- that where market participants rely on services from other parts of the energy system, access and charging arrangements are non-discriminatory.

5.6. In terms of relevant economic theory, Ramsey pricing theory and public economics theory suggest that to minimise the distortions caused by residual charges, they should be charged to end users based on how likely they are to react (by changing their behaviour) to these charges. Charges should be designed to minimise the likelihood that the charge itself changes the behaviour of any group of users benefitting from the system.

5.7. However, application of this approach directly to electricity network residual charges is not straightforward:

- First, as technology develops and the way people use the energy system changes, it is not easy to identify which users will react to charges, and which will not. Additionally, the energy system is subject to fast, dynamic change. Choosing a new measure to set residual charges on may prompt innovation in technology or energy services that can increase users' price elasticity on that measure.
- Second, the reason that some users will react less is important to consider. Recovering the majority of residual charges from consumers who cannot install generation or storage may place an unreasonable burden on that sub-group of consumers.

5.8. In light of these concerns, we think that while reducing distortions to network users' incentives in designing residual charges is important for the efficiency of the system, it is not the only aim we should have in reforming residual charges.

Our proposed principles

5.9. In light of the above considerations we propose three core principles for assessing options for residual charging:

- Reducing distortions;
- Fairness;
- Proportionality and practical considerations.

5.10. We welcome views on these, and on others which we should consider.

Reducing distortions

5.11. There is a wide academic consensus that regulated costs which are not recovered via cost-reflective charges should be recovered in ways that minimise their impact on, or distortion of, decisions about when and how to access and use the network. However, academic views also recognise potential challenges in doing this. We will focus on reducing distortions that we can observe, or foresee, causing harm.

5.12. Under this principle, we will also seek to reflect transmission and distribution network convergence. We don't think residual charges should drive inefficient investment and operational decisions between voltage levels.

5.13. We also recognise that some people might consider some distortions to investment 'preferable' to others of equal size – perhaps in relation to low-carbon compared with high-carbon generation technologies, or towards overall demand reduction rather than new ways to meet demand. If we carry out an SCR, we will seek to understand the different views on which distortive effects might be more or less harmful to the system and to current and future consumers' interests. We would welcome views at this stage on this aspect of reducing distortions.

Fairness

5.14. We noted in our joint Call for Evidence that network charges should represent a cost-reflective and fair recovery of network costs. Cost-reflectivity is less directly relevant in setting residual charges. In relation to fairness, we recognise that different people will have different views on what is fair. If we proceed with the SCR we will seek to understand these views in assessing options. We welcome views at this stage on what respondents would consider fair, or unfair, in relation to residual charges.

5.15. Any change will have distributional impacts that need to be fully understood and, where appropriate, mitigated. In particular, we will need to take account of impacts on those in vulnerable situations.

Proportionality and practical considerations

5.16. We think that we should bear a number of aims in mind in deciding to make changes:

- We will prioritise and target changes where we think there is the greatest justification for intervention. As an example, if a problem arises mainly among non-domestic consumers, then changes to their charges should be a higher priority than changes affecting all users.
- Simplicity. Complexity is frequently a side-effect of seeking increased cost-reflectivity in charges. Given cost reflectivity is less directly relevant to residual cost recovery we will aim to find new charges that are easy to calculate, and to understand.
- Reducing volatility. These charges should be predictable as far as possible. We will seek to reduce the possibility that some users' relative contributions change materially as a result of other users' decisions.
- Noting that other aspects of the system, including how forward-looking charges are set, may change in future, we will try to develop an approach that would need few if any adjustments when other aspects change.
- Continuity of supply and the ability of all consumers to access electricity when they need it. Short of complete disconnection from the network, we think that all consumers should make a contribution to these residual charges. This reduces the risk that any group of consumers will find themselves facing an unacceptably high network residual charge.

5.17. In considering how well a new approach would serve the interests of current and future consumers, we will have regard to all of these principles while recognising that in relation to charges, which affect consumers' bills, some might be more important than others. For example, a very simple charge - like the same charge for every connected user - might have effects on consumers in vulnerable situations that we would not consider acceptable.

5.18. If we launch an SCR, we will set out our final principles, having taken account of responses to this consultation.

6. Some options for setting residual network charges

Chapter Summary

We are seeking views on a how transmission and distribution residual network charges should be apportioned between groups of users. We are also seeking views on a range of approaches that we could take to setting these charges.

Question 7: In future, which of these parties should pay the transmission residual charges: generators (transmission- or distribution-connected), storage (transmission- or distribution-connected), and demand, and why? What proportion of these charges should be recovered from each type of user?

Question 8: In future, which of these parties should pay the distribution residual charges: generators (transmission- or distribution-connected.), storage (transmission- or distribution-connected), and demand, and why? What proportion of these charges should be recovered from each type of user?

Question 9: Do you support any of the five options we have set out for residual charges below, and why?

Question 10: Are there other options for residual charges that you think we should consider, and why?

Question 11: Are there any options that you think we should rule out now? Please say why.

Who should pay residual charges?

6.1. In carrying out a review of residual charges we think we should also consider whether their apportionment between generation and demand is right, for both transmission and distribution networks.

6.2. For example, one important way in which some argue public economics theory should be applied is to have all the residual charges paid by demand users, with no residual generation charging. This is the case for GB distribution network residual charges. Implementing a similar approach in transmission would involve a significant change. However, we would be interested to hear views on this in response to this consultation.

6.3. As all system costs – including all network charges - fall ultimately on end consumers, having generators pay residual charges might mean lower residual

charges for demand users, but not necessarily lead to lower costs to consumers overall. The effects of residual charges on generation investment and behaviour, and ultimately on system costs, are complex and – like for demand – depend on how the charges are set.

6.4. Alternatively, if the transmission generation residual charge remains, we would be interested to know views on what the split between that and the TDR charge should be. We have approved a code modification, contingent on a future disapplication of European limits on transmission generation charges, that would set the percentage share of the future generation residual share (as a proportion of the total transmission residual charges) at the level at the time the modification takes effect.

6.5. At distribution level, generation does not currently pay any residual charges. All of the costs are recovered from demand. Bearing in mind that we are aiming for residual charges to have less influence than now on locational decisions, we would be interested in views on whether this difference between distribution and transmission residual charges is material. Additionally, we would be interested to know views on the best way to address any distortion which may arise from this difference.

6.6. In relation to storage, we think that changes should be made to some aspects of charging for storage under the current arrangements, and we set these out in chapter 8. Any changes which result from our proposed review of residual charging would apply to storage in future.

Options for setting residual charges

6.7. Different mechanisms for setting residual charges will meet the proposed principles set out in chapter 5 to different degrees. We list below a range of different approaches for how residual charges could be set.

6.8. These options build on our assessment about how the current, and alternative, residual charges may distort network user incentives and lead to changes in users' relative contributions, as well as the report we commissioned looking at regulatory approaches elsewhere in the world.

6.9. We have identified five high-level options for how residual charges could be constructed, and these are set out below. This is not an exhaustive list and we welcome views on other options we could consider. We also welcome views on how any of these options, or others, could be improved by specific adjustments.

Option A: a charge linked to net (kWh) consumption

6.10. This would be similar to the current charge although without a time of use element, so without savings for reducing net demand at peak times, nor increased costs for those who cannot. Residual charges would be lower for

consumers reducing net demand, either by decreasing demand or installing generation behind the meter. This has potential for affecting the distribution of charges between groups of users: those who cannot afford to install generation behind the meter, or set up a private wire arrangement, will pay more towards the network common costs. This option would have low implementation costs.

Option B: a fixed price charge

6.11. There are a number of ways a fixed price residual charge could be derived, for example based on profile class or another measure.¹⁹ An important benefit of fixed price charges is that they reduce potential distortions to network use by separating residual cost recovery from network users' consumption or generation choices. Once a fixed charge has been paid, users face price signals sent by the forward-looking part of network charges (often based on marginal costs) and the price of electricity at the time. The distributional effects of fixed price charges on different groups of consumers are complex and the precise design of charges would need careful consideration, particularly for low energy consumers who may be in more vulnerable situations.

Option C: fixed charges set by connected capacity

6.12. Another way to derive a fixed price charge for residual recovery would be on the basis of connected capacity. This could be based on fuse size, although in future smart meters would allow for more sophisticated options, for example charges based on utilised as well as contracted network capacity. As we note above, this has been applied in the Netherlands since 2009 with accompanying measures to protect smaller consumers. There is some potential for the residual charge burden to shift between groups of users. Some users may be able to move enough generation, demand (and possibly storage) behind the meter, or onto a private wire, to be able to reduce their fuse size. Doing this would mean those users taking on greater risk by limiting the amount of electricity they can receive from the grid, for example if there is a generation failure on the private wire. There is a lot of flexibility in the design of a capacity charge - as illustrated by the variety of approaches taken elsewhere in the world.

Option D: gross kWh consumption

6.13. Basing residual charges on gross demand would mean that whether generation is behind the meter or has its own connection would not affect the amount of the charge. Network users who could reduce their total consumption would have lower residual charges. However, establishing a network user's gross demand inherently implies knowing generation output from behind the meter - or alternatively 'deeming' generation output for groups of users based on shared

¹⁹ MIT in its 2016 'Utility of the Future' report suggested property tax, or property size. <http://energy.mit.edu/research/utility-future-study/>

characteristics. We would be interested in views on this aspect of a gross charge.

Option E: a hybrid approach

6.14. A hybrid approach could be that whilst low usage domestic consumers pay on net volumetric consumption, others pay fixed charges based on capacity.

6.15. There could be potential for shifts in the residual charge burden between consumers. Depending on how this approach was implemented, it could mean that those domestic consumers who currently have, or who can install, their own generation/storage could pay lower residual charges than those who do not. As the uptake of domestic storage and generation increases, this could increase residual charges falling on consumers without it.

6.16. As the hybrid option suggests, there is considerable flexibility in residual charge design. In particular, as we note in the principles chapter above, we want to ensure changes to charges are focused and address the most important effects on different groups of current and future consumers. For example, all of the options B, C, and D could be adjusted to apply the changes only to non-domestic consumers, or to non-domestic consumers first with implementation for domestic consumers later. While the consumers most likely to install generation and/or storage, or to set up private wires, are currently in the non-domestic sector, changes to non-domestic residual charges to mitigate the charge effect on other users may be more important in reducing the impacts on other consumers than wider changes.

7. Benefits for smaller embedded generation, relative to other generation

Chapter Summary

There are some elements of the charging system that we think provide advantage to smaller EG compared with other generation. We are seeking views on whether any of these arrangements should be reviewed or changed. For the avoidance of doubt, we are not asking for views on our minded to decision on CMP264/265 in this section.

Question 12: Do you think we should do further work to analyse the potential effects of the charging arrangements for smaller EG (called 'embedded benefits')?

Question 13: Do you think changes are needed to the current charging arrangements for smaller EG, and when should any such changes be implemented?

Question 14: Of the embedded benefits listed in our table, do you think that any should be a higher or lower priority?

Question 15: Do you think there are other aspects of transmission or distribution network charging which put smaller EG, or any other forms of generation or demand, at a material disadvantage?

Background

7.1. 'Embedded benefits' are the payments which smaller EG receive, and the charges they do not have to pay, compared to larger (over 100MW) EG and transmission connected generators. These benefits arise because smaller EG are treated as negative demand for transmission charging purposes. This means that smaller EG can receive payments for helping suppliers to avoid transmission demand charges (or can receive payments directly from National Grid), and they also do not pay the transmission generation charges that other generators pay. The fact that smaller EG is treated as negative demand rather than as generation for the TNUoS locational charges provides benefits to smaller EG in some cases, but not in others. It is included with other embedded benefits but we recognise that this can provide both benefits and disbenefits to smaller EG.

7.2. The different embedded benefits that these arrangements give rise are set out in Table 2, below.

Table 2: Embedded benefits for smaller EG, relative to other generation

| Embedded benefit element | What is it? | Current value |
|--|---|--|
| TNUoS demand residual (TDR) payments | This is the largest embedded benefit. Smaller EG can receive these payments from suppliers or Grid. We are consulting on a minded-to decision on code modification proposals that would change these arrangements. | c. £45/kW |
| TNUoS generation residual (TGR) | Smaller EG currently does not pay the TNUoS generation residual. | c£0.5/kW |
| TNUoS locational charges (demand and generation) ²⁰ | Smaller EG that generates at triad (mainly non intermittent EG) is treated as negative demand and hence faces the inverse of the demand locational signal. This is roughly equivalent to facing the generation locational signal. The differences between the two signals are: <ul style="list-style-type: none"> the difference in charging bases, with triad for demand vs TEC for generation different treatment of intermittent/non-intermittent different zonal differentiation (27 generation zones vs 14 GSP Groups). | Demand locational charge varies by region and is £-5.09/kW to £6.54/kW Generation locational signal varies by region and technology and is £-6.91/kW to £19.14/kW |
| BSUoS demand charge payments | The BSUoS demand charge is based on a supplier's net consumption at the GSP groups, so smaller EG can offset demand and receive payments from suppliers for reducing their BSUoS charges. | c£2/MWh which is equivalent to c£4-17/kW depending on load factor ²¹ |
| BSUoS generation charge | Smaller EG currently does not pay the BSUoS generation charge | c£2/MWh which is equivalent to c£4-17/kW depending on load factor |

7.3. We think that the elements in the table above are preventing a level playing-field between smaller EG and other forms of generation. We discuss each element below.

²⁰ The fact that smaller EG is treated as negative demand can provide both benefits and disbenefits compared to other forms of generation.

²¹ BSUoS charges vary between £-0.23-£47.78/MWh depending on the settlement period. £2.40/MWh is an average across the 2016-/17 period. The range presented here assumes a load factor of 20-80%

TDR charges

7.4. On 1 March we published our minded-to decision for consultation on CMP 264 and 265, to move to gross metering of demand at the grid supply point (GSP), thereby removing the ability of smaller EG to get paid for helping suppliers avoid TDR charges, and put in place a payment for avoided GSP costs. We are planning to reach a final decision on these changes in May. We will take account of that decision in this proposed work. For the avoidance of doubt, we are not asking for views on our minded-to decision on CMP264/265 in this consultation.

TGR charges

7.5. The fact that smaller EG does not pay the TNUoS generation residual (TGR) charge has been one of the benefits that smaller EG has compared to larger EG and transmission connected generation. Historically there was a lower amount of smaller EG and it was thought that it did not have much impact on the electricity flows on the transmission system. However as the amount of smaller EG has increased, it is increasingly affecting electricity flows on the transmission network.

7.6. In Chapter 6, we have asked in future which network users should pay the transmission residual charges, including whether transmission or distribution connected generation should pay these charges. In this chapter, we are asking specifically for views about the fact that smaller EG currently does not face the TGR charge.

7.7. Historically, the residual charges have always been positive. However the TGR, due to a number of factors, is forecast to become negative, meaning that transmission, and over 100MW EG, would receive a payment or reduced charge related to the TGR charge. We have stated that we do not consider a negative residual charge to be consistent with the development of an efficient transmission network and a well-functioning wholesale market.

7.8. The fact that smaller EG does not pay the TGR is a relatively small benefit at present, which would become a disbenefit if the TGR becomes negative. However, the level of this charge could change significantly in the future so we are seeking views on whether smaller EG should face the TGR charge and, if so, when any change should be made.

TNUoS demand and generation locational signals

7.9. The current approach of forward-looking locational charges is designed to promote efficient use of the network by, for example, providing a signal to generators of the impact that their location decision has on transmission network investment. We think that it is important that all generation receives signals about its impact on the transmission system.

7.10. We note that currently the fact that smaller EG is charged the negative of the TNUoS demand locational charge does provide such a signal to smaller EG that generates at triad periods. However, as noted above, this signal is not the same as the signal received by transmission-connected generation and larger EG who pay TNUoS generation charges. We think this different treatment could be creating a distortion.

7.11. As the amount of smaller EG has increased, it is increasingly affecting electricity flows on the transmission network. It does this both through the exporting of power from the distribution network to the transmission network (via 'exporting GSPs'), and also through the increased displacement of electricity flows on the transmission network. Displacement occurs when new EG is added to the distribution network which then means that electricity that used to flow from the transmission network to that part of the network is now displaced and flows elsewhere. This is similar to the impact of a generator being connected to the transmission system.

7.12. The size of the differences in locational signal can provide advantages or disadvantages for smaller EG, depending on the location. Our initial thinking is that this may remain appropriate at least in the near term, and we note that locational signals for all generation are being considered as part of our work on flexibility and future-focused strategy. It is not yet clear whether any changes to these arrangements will come out of this work, so we are asking for views on this.

7.13. We welcome views on whether changes should be made to these arrangements and when any such changes should occur.

BSUoS demand and generation charges

7.14. Smaller EG can receive payments from suppliers for helping them to reduce their BSUoS charges. Additionally, smaller EG do not pay BSUoS charges.

7.15. We have expressed concerns that this benefit is likely to distort operational decisions (ie dispatch), by bringing some generators into merit at times when they should be out of merit (ie rendering it profitable for them to generate at times when otherwise it would not be profitable for them to generate).

7.16. In relation to the BSUoS arrangements for smaller EG, we note that some stakeholders have expressed concerns with BSUoS more generally. While we do not at present have a firm plan or timeline for changes to the BSUoS arrangements, we note that there are current code modification proposals aimed at reducing BSUoS volatility. We are also considering, through our future-focused strategy and flexibility work whether there is a need to consider wider changes to how BSUoS is set.

7.17. We do not yet know whether the outcome of our flexibility and future-focused strategy work will include wider changes to BSUoS. Nor do we know how soon any such changes would be implemented; so the current system of BSUoS charging may remain in place for some time. We therefore think it is right to seek views on whether we should review the BSUoS treatment of smaller EG, ahead of any future changes.

Timing of any changes

7.18. In considering any future changes to these arrangements for smaller EG, we would be interested in views on how urgently changes are needed. We are therefore seeking views in this consultation on whether changes are needed to the current charging arrangements for smaller EG, and when should any such changes be implemented.

7.19. We are also seeking views on whether there are other aspects of transmission or distribution network charging which put smaller EG, or any other forms of generation or demand, at a material disadvantage.

8. Our views on residual and BSUoS charging for storage

Chapter Summary

Following extensive engagement with industry stakeholders, we think that some changes should be made to transmission and distribution residual and BSUoS charges for storage. We think that these should be taken forward ahead of any wider changes to residual charging. We are setting out these views for consultation.

Question 16: Do you agree with our view that storage should not pay the current demand residual charge, at either transmission or distribution level?

Question 17: Do you agree with our view that storage should not pay BSUoS on both demand and generation?

Question 18: Which of the BSUoS approaches describe is more likely to achieve a level playing field for storage?

Question 19: Do you think the changes in this chapter should be made ahead of any wider changes to residual charging that may happen in future? Do you agree with our view that these changes should be implemented by industry through the standard code change process?

Background

8.1. In our recent call for evidence with BEIS on a 'Smart Flexible Energy System'²² we set out our view that while storage should pay forward-looking network charges for both import and export, there are instances where storage may pay more towards the residual cost of the network when compared with other network users. We think this could place them at a competitive disadvantage.²³ Many of the respondents to the call for evidence agreed with this and the need for changes to create a level playing field. In this chapter we set

²² Smart, Flexible Energy System – a call for evidence
<https://www.ofgem.gov.uk/publications-and-updates/smart-flexible-energy-system-call-evidence>

²³ In the National Infrastructure Commission's report on Smart Power, recommendation 2a) was that 'DECC and Ofgem should review the regulatory and legal status of storage to remove outdated barriers and to enable storage to compete fairly with generation across the various interlinked electricity markets. The reforms should be proposed by Spring 2017 and implemented as soon as possible thereafter.'
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505218/IC_Energy_Report_web.pdf

out our views on the application of residual charges and BSUoS charges to standalone storage, and storage co-located with generation.

8.2. For both TNUoS and DUoS the majority of residual charges currently fall on demand and is based on time of use charges, ie demand customers pay them if they use the network at peak times. This means that generators generally don't pay residual charges. Storage users pay network charges when as demand users and when they generate, so they pay residual charges if they use the distribution and transmission network at peak times.

8.3. In certain scenarios storage will pay more residual charges than other users of the network, and in particular more than other users of the network that they compete with. We think it is important to ensure storage is not at an undue disadvantage relative to others providing the same or similar services. To achieve this, we think changes are needed to how storage pays residual charges.

8.4. As discussed previously, residual charges do not relate to specific costs that any user imposes. We also note that in setting residual charges, we want to reduce the potential for them to distort behaviour or harm competition. At the moment because of how the charges are structured, storage will generally contribute more to residual charges than either generation or demand. Storage largely competes with generators in providing services to suppliers, customers and network operators, so we think that residual charges should apply to storage in a similar way as to generators.

8.5. Storage can also sometimes compete with demand, to take excess generation off the network and help to balance the system. However, a key difference between demand and storage is that demand is an end user of electricity: its primary purpose for connecting to the network is not for the provision of energy or flexibility services, unlike generation and storage. When the electricity provided by the storage operator is consumed by an end user, demand residual charges apply.

8.6. As discussed throughout this document, we are currently considering different approaches to the recovery of residual charges more generally. However, we think that there are adjustments to the current system that are warranted in the short term, in order to address a potential distortion to competition.

8.7. Additionally, as noted in chapter 7, we recognise that some stakeholders would prefer a more wide-ranging review of BSUoS charges. We are considering through our future-focused strategy work whether there is a need to think about wider changes to the system of BSUoS charging, and we note there are current code modifications aimed at reducing BSUoS volatility. We are not proposing to consider wider BSUoS questions in the TCR. We think that the relative disadvantage for storage from the current arrangements – whereby storage pays BSUoS as both demand and generation – is sufficiently material that it should be addressed ahead of any potential future change to BSUoS.

Changes we think should be made

8.8. We have considered a number of ways of changing storage charges, and in our view the most appropriate way forward is to treat storage in a similar manner to generation for the purposes of residual charging. This would mean that storage would continue to pay forward-looking charges in respect of both its demand and generation at both transmission and distribution levels, but only pay the generation residual charge at transmission level, and not pay the demand residual charge at distribution level. (There is currently no generation residual charge at distribution level.)

8.9. BSUoS is a cost recovery charge that covers the costs of day to day and half hourly system operations of the transmission network. The charges are calculated for each settlement period on a £/MWh basis and are charged equally to generators and demand based on their metered volume in the relevant period. Our view is that the current application of BSUoS to storage means that storage will pay more BSUoS charges than its competitors providing similar services. We have identified two potential approaches to address this:

- **Balancing Mechanism Unit (BMU) Definition:** define storage BMUs as either importing or exporting, irrespective of their actions in any particular settlement period. Storage would then earn import/export credits to off-set its actions in instances in which power flows in the opposite direction. For example, if storage was defined as an importing BMU, it would earn credits when exporting which would 'net off' the charges it receives when importing.
- **Gross Charging:** charge BSUoS to storage on the basis of either its gross imports or gross exports, rather than the net position, irrespective of its actions in any particular settlement period. Charging storage on the basis of gross exports would align the treatment of storage more closely with generation.

8.10. The tables below set out the charges that apply now, and the changes we think should be made, on which we are seeking views.

Table 3: Transmission charges currently applied to stand-alone storage

| Charges | Change |
|--|---------------------------------------|
| <p>TNUoS import and export charges calculated based on long run marginal cost load flow model</p> <p>HH TNUoS import Locational (forward-looking) Residual (cost-recovery)</p> <p>HH import is charged according to the average demand (MW) they take over the three Triad periods each year</p> <p>HH TNUoS export Locational (cost-reflective) Residual (cost-recovery)</p> <p>The storage facility is charged according to the contracted max capacity TEC it holds each year.</p> <p>The export charge also varies based on a historical annual load factor and whether it is classed as intermittent or not.</p> | <p>Remove residual import charges</p> |

Table 4: Distribution charges currently applied to stand-alone storage

| Charges | Change |
|---|---|
| <p>CDCM In the CDCM, storage export is treated as non-intermittent generation</p> <p>HH import HH-metered storage pays import unit charges and daily fixed rates. It also pays capacity charges, excess capacity charges and reactive power charges. Cost recovery at LV and HV levels is partly achieved through a fixed adder on a £/kWh basis and partly through the quasi-incremental cost model.</p> <p>HH export Storage receives unit credits for export which are calculated on a p/kWh R/A/G basis for HH non-intermittent generation at CDCM level.</p> <p>Storage export pays a daily fixed charge, and reactive power charges.</p> | <p>Remove residual demand charge from storage in the CDCM</p> |
| <p>EDCM In the EDCM storage receives location-based credit payments (for the super-red periods) on a site specific basis compliant with P2/6 requirements.</p> <p>Non-intermittent:</p> <ul style="list-style-type: none"> Import/export super red unit rate (p/kWh) Import/export fixed charge (p/MPAN/day) Import/export capacity rate (p/kVA/day) Exceeded capacity charge for import/export (p/kVA/day) <p>Intermittent:</p> <ul style="list-style-type: none"> Import super red unit rate – no export credit Import/export fixed charge (p/MPAN/day) Import/export capacity rate (p/kVA/day) Exceeded capacity charge for import/export (p/kVA/day) | <p>Remove residual demand charge from storage in the EDCM</p> |

Table 5: BSUoS charges currently applied to stand-alone storage

| Charges | Change |
|--|--|
| <p>BSUoS costs are split 50:50 between generation and demand and recovered per MWh based on net usage on each half hour.</p> <p>A transmission-connected stand-alone storage operator providing a similar service as a generator will contribute more towards BSUoS.</p> | <p>Define storage as import/export BMU and net off opposite flows; or</p> <p>charge BSUoS on the basis of gross imports or exports</p> |

8.11. We think the proposed changes should apply to storage units co-located with generation when relevant to ensure generation with co-located storage can compete on a level playing field with other forms of generation. We note that storage co-located with generation is likely to be used to smooth export from the generating unit and so will be charging from that unit rather than the network and so would not be liable for the demand residual anyway.

8.12. We do not think that these changes to residual and BSUoS charges should apply to storage units co-located with demand, which we think should continue to face its existing charging structure.

8.13. As we noted in the call for evidence on a Smart Flexible Energy System, our view is that it is appropriate for storage to pay forward-looking charges that reflect the costs that they drive on both import and export. It may be appropriate to consider whether the current demand and generation forward-looking charges are adequate in the way they are calculated for storage. However, this is out of the scope of this consultation. We note that industry is already considering this in respect of the EDCM through DCUSA modification DCP 274 which is exploring whether the Operational and Maintenance element of network charges is applied appropriately to storage.

Next steps

8.14. As discussed in chapter 9, we are seeking views on the most appropriate delivery mechanism for wider changes to the charging system. Given that there is already considerable industry agreement that changes are required to network charging for storage, we think that these changes should take place outside of an SCR process. We think that the changes we have identified are important and should be taken forward by industry, without waiting for the SCR process to develop. If the required changes are not taken forward by industry, we would consider widening the scope of the SCR to include this work.

9. Our approach to taking these changes forward

Chapter Summary

We think that the wider charging review work that industry is undertaking should be overseen by a Charging Coordination Group (CCG). We propose that the TCR is delivered in a phased way, through a combination of industry-led code modifications for more developed work, and a Significant Code Review for longer-term work. We welcome views on our proposals.

Question 20: We would welcome your thoughts on the potential make-up of a CCG. Please refer to the potential role, structure, prioritisation criteria and assessment criteria.

Question 21: Do you agree with our proposed delivery model, including its scope?

Question 22: Do you agree that our proposed SCR process is most appropriate for taking forward the residual charging and other arrangements for smaller EG discussed in this document?

Opportunities to coordinate wider charging review work

The context: wider charging work ongoing at present

9.1. The TCR is focused on residual charges, elements of charging for smaller EG, and some elements of charging for storage. As noted in the Introduction, we will be looking at other aspects of charging as part of our wider work programme, including our future-focused work and our joint work with BEIS on a smart, flexible energy system. At the same time, industry is taking forward wider, interrelated work on network charging. This includes:

- National Grid's Review of transmission charging²⁴
- The Distribution Charging Methodologies Forum's reviews of the DNOs' two distribution charging methodologies, the CDCM and the EDCM²⁵

²⁴ Information can be found at http://www2.nationalgrid.com/UK/Industry-information/System-charges/Electricity-transmission/charging_review/

²⁵ Information can be found at <http://www.energynetworks.org/electricity/regulation/distribution-charging/distribution-charging-working-groups.html>

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- The Energy Network Association's charging group considering charges that reflect appropriate whole-system price signals for both the transmission and distribution as part of the ENA's TSO-DSO programme.²⁶

9.2. We are involved in each of the above pieces of work.

9.3. To help manage the wider interaction of the TCR with these ongoing reviews, we are planning to establish a **Charging Coordination Group (CCG)**. We are aware of existing desire from some parts of industry for such a group to help ensure that the network charging reviews are progressed in a coherent manner.

9.4. We would expect this to help address some of the risks of our proposed delivery approach for the TCR, described below. In particular, a higher level of co-ordination will help steer the complex cross-code issues and will provide a forum for stakeholders to meaningfully engage in policy development. The CMA code governance remedies are designed to drive better coordination of cross-code changes, so we will keep status of the CCG under review as the CMA remedies are delivered.

The potential form of a Charging Coordination Group

9.5. In realising these goals, the role and structure of the group will be critical. We currently expect it to be an Ofgem-chaired group, but with wide industry representation to help steer the overall charging reform programme. We also expect the existing reviews to continue but to be given a steer on overall direction by the CCG. Working with stakeholders, we plan to initiate the development of the group during this consultation period. The final purpose and functioning of the group will be confirmed once we have considered all consultation responses.

9.6. We think that the CCG will require two sets of overarching (and interrelated) processes to help it set direction. The first will be a means of prioritising the various reforms emerging from the different reviews. This will support a well-coordinated approach to programme delivery and help minimise duplication and wasted effort. We plan to develop the approach to prioritisation as a first priority of the CCG.

9.7. The second process would assess the merits of any proposed changes to charges before in-depth development work is taken forward. The criteria for assessing the merits of proposed changes could be informed by a number of sources, including:

²⁶ See the ENA's report at <http://www.energynetworks.org/assets/files/news/publications/Reports/TDI%20Report%20v1.0.pdf>



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- the objectives of the relevant codes to which change may be needed to give the change effect
- our statutory duties
- where relevant, the proposed principles of the TCR set out in this document
- any evidence emerging from the ongoing charging reviews
- any evidence emerging from responses to 'Smart, Flexible Energy System – a call for evidence' that we published jointly with BEIS last November, and our future-focused strategy work.

9.8. We would expect both sets of criteria to be developed by the CCG, once established.

Delivery options and our preferred approach for the TCR

Significant Code Review background

9.9. We signalled in our draft Forward Work Plan for 2017-18 that the TCR may require a SCR to help deliver the necessary reforms. An SCR is an Ofgem-led review of code-based issues and can be used to initiate wide ranging and holistic change and implement reforms. SCRs can be used to provide top-down solutions for cross-code issues such as those with our electricity network charging framework.

9.10. Changes resulting from the Code Governance Review (Phase 3) now give us three process options for an SCR (and the ability to move between certain options):

- Ofgem directs licensee(s) to raise modification proposal(s).** At the end of the SCR phase of the process we would issue a direction to the relevant licensee(s). Our direction may set out high level principles (with the detail to be developed by industry) or more specific, detailed conclusions to be given effect through code change(s). The modification(s) would follow the standard industry code modification processes.
- Ofgem raises modification proposal(s).** At the end of the SCR phase of the process we would raise a modification(s) under the relevant code(s), and the modification(s) would follow the standard industry code modification processes.
- Ofgem leads an end-to-end process to develop code modification(s).** The standard industry process for modification

proposals would not apply; Ofgem would lead consultation and engagement needed to develop the appropriate code change(s). We would expect close involvement of the industry; for example, we may establish and lead workgroups similar to the approach under the standard industry code modification processes (but led by us).

What could be covered by an SCR

9.11. Our current proposal, subject to consultation, is that the SCR would cover:

- residual charges at both transmission and distribution level, for both demand and generation; and
- elements of the charging arrangements for smaller EG.

9.12. As noted in chapter 8, depending on the outcome of this consultation in relation to residual and BSUoS charges for storage, we might decide to take some or all of those changes forward in this SCR too. Our current preference is for changes to storage charges to be taken forward by industry.

TCR delivery options

9.13. As described elsewhere in this document, we are proposing a targeted review of residual charges at both transmission and distribution level, for both demand and generation. This makes the review multi-faceted, with a number of interrelated components and attendant delivery challenges. While the different components are interrelated, the resolution of each of them may not run to the same timetable. The changes that may result from the review are likely to apply across more than one industry code.²⁷ Therefore we are proposing to undertake an SCR among our delivery options in order that we can lead a co-ordinated process to analyse and consider issues across transmission and distribution, and across codes.

9.14. We are seeking your views on the proposed scope of the TCR which is set out above.

9.15. We think that some of the elements in scope of the proposed TCR are more developed than others, and could be delivered earlier by industry under the standard code modification processes. We would therefore be open to considering on a case by case basis, as our TCR progresses (and in consultation

²⁷ We expect the TCR to affect the BSC, CUSC and DCUSA.

Targeted Charging Review: a consultation

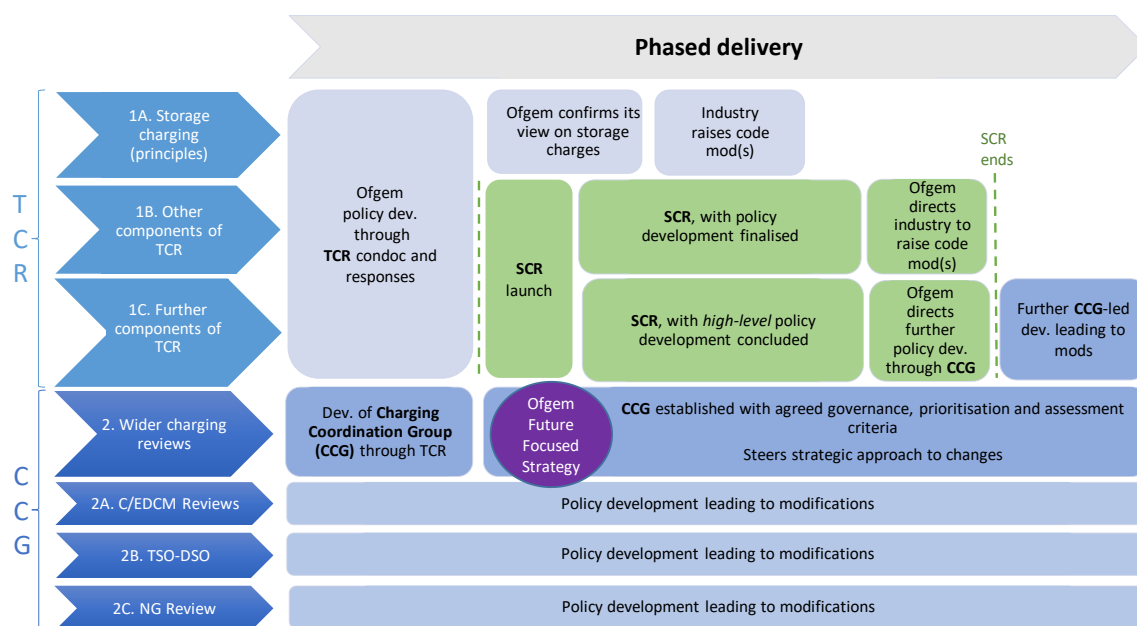
with the CCG if appropriate), which elements could progress early through relevant parties raising modifications (ahead of the SCR concluding).

9.16. Those elements that need further policy development would remain in scope of our SCR, and appropriate proposals raised on these when our SCR concludes.

9.17. Subject to responses to this consultation, if we decide to proceed with an SCR, we will issue our launch statement in summer, confirming the scope and expected timings.

9.18. The diagram below illustrates how the phased delivery might work.

Figure 4: how our preferred approach might work



9.19. Our current view is that the SCR would initially encapsulate all elements in this consultation apart from storage (which could be delivered sooner through the code modification process). The timescale of the work will depend on the speed of progress in policy development.

9.20. Of the three process options, our preference is for the first SCR process option (for those elements covered by the SCR): (i) Ofgem directs licensee(s) to raise modification proposal(s). We think it is appropriate for the issues covered by the TCR, but we would welcome views. We also note that there is scope to review the most suitable route, if appropriate.

9.21. We acknowledge the interrelationships of the issues and can see a process with more Ofgem control may help coordinate progress. We would also seek to

implement lessons learned from previous experience with SCRs, such as adopting a well-defined scope and consistent governance. We think our proposed approach has particular advantages when combined with a coordination group providing overall direction. The coordination group is explored above.

Next steps

9.22. We will consider the responses to the consultation before deciding on whether or not to launch an SCR. Reasons for us not to proceed may include (but would not be limited to): that the work could be progressed through other code governance processes; or deciding the area of work may be unsuitable for an SCR as the solution lies outside of the industry codes. We would publish any decision not to proceed with an SCR and the reasons for it.

9.23. If we were to proceed, we would publish a statement on our website (the launch statement), and would also aim to highlight this to the code panels that we expect to have an interest in the SCR. The statement is likely to include (taking into account the responses to our consultation): the scope of the SCR and any issues in this consultation that we are not proposing to include in it; the process option to be followed; the reasons for launching and for carrying out the SCR rather than an alternative action; and, where possible, an initial estimate of the time and cost implications for both Ofgem and industry. It should be recognised that the information set out in this statement may change as the SCR process is followed.

9.24. Once an SCR has been launched, new modification proposals, which cover similar ground to the SCR, may not proceed through the standard industry modification process. Only urgent proposals or those specifically exempted by us will be allowed to proceed through the code modification process.

Appendices

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Appendix 1 – Network charging in GB

Network charges

1.1. The companies that own and operate electricity transmission and distribution networks in GB are regulated monopolies. They operate under price controls set by Ofgem. These determine the revenues that these companies are allowed to recover in any given year. Network companies recover these revenues from network users, including generators and supply businesses, by charging for connection and use of the system.

1.2. The Transmission Network Use of System (TNUoS) charges and connection charges collect the transmission companies' allowed revenues. The Distribution Use of Service (DUoS) charges and connection charges collect the distribution network operators' allowed revenues.

1.3. The System Operator (SO) is responsible for balancing the electricity system on a continuous basis. The internal and external costs²⁸ that National Grid incurs in carrying out this role are passed through to users of the system via balancing services use of system (BSUoS) charges.

TNUoS charges

1.4. Transmission Network Use of System (TNUoS) charges are intended to cover the cost of installing, operating and maintaining the transmission network, with part being recovered from generation and part from demand.

Generator TNUoS, which is paid by transmission connected generators and embedded generators over 100 MW is made up of:

- local charges, which represents an estimate of the incremental costs of the local circuits and substations;
- wider locational charges, which reflect the incremental cost of the generator on the wider network; and
- residual charges, a cost recovery element which ensures that the proportion of total allowed revenues of the Transmission Owners (TOs) allocated to generators that is not covered by the local and wider charges.

1.5. This is charged on the generator's capacity and for some aspects of the locational charge, and varies with load factor and technology type.

²⁸ Internal costs are those incurred by NGET to fund the System Operator operations itself (such as staffing, IT costs). The external costs are those incurred by NGET to balance the system (such as procuring additional energy to meet demand or to manage a constraint).

1.6. Demand TNUoS, which is recovered from suppliers, is made up of two components:

- locational charges, which estimates the incremental transmission cost resulting from connections to the network according to where the demand is located in GB. It shows the difference in cost of locating, and using the network, in different demand zones within GB; and
- Residual charges, which recover costs to ensure that the total allowed revenue is recovered by Transmission Owners (TOs). The residual is the same for all demand users, irrespective of their location in the country.

1.7. The TNUoS demand charges are levied based on triad demand – that is the net demand averaged across the three settlement periods of highest transmission system demand, between November and February, with each settlement period separated by at least 10 days.

DUoS charges

1.8. The majority of users connected to the distribution networks pay DUoS charges set under the Common Distribution Charging Model (CDCM).

1.9. The CDCM is used to estimate the costs imposed by distribution network users. The difference between the outputs of the model and the DNOs' allowed revenues is reconciled through a 'scaling' procedure whereby demand users' pre-scaled charges are adjusted (upwards or downwards) to arrive at a set of charges that are forecast to generate a revenue stream equal to the DNO's allowed revenue. Scaling is included in the tariff unit rates.

1.10. In 2017-18, around £1.4bn, of a total of £5.2bn, is forecast to be recovered through scaling in the CDCM.

1.11. A small number of users are connected to the Extra-high voltage level of the distribution networks. Their charges are set under the Extra-high voltage Distribution Charging Model (EDCM).

1.12. The EDCM calculates site specific charges for each customer. A power flow model is run based on the actual network to determine the incremental costs and the derived charges are split between capacity and consumption. Scaling is applied to recover the EDCM share of allowed revenue, which adds up to around £150m in total across GB.

BSUoS charges

1.13. BSUoS charges are split 50:50 between generation (paid by transmission connected generators and embedded generators over 100 MW) and demand and recovered per MWh based on net usage of the system in each half hour. The forecast total charges to recover external balancing costs and internal costs in 2016-17 is c.£1.2bn.

Appendix 2 - Glossary

A

Allowed Revenue

Energy networks are natural monopolies and therefore there is no realistic way of introducing competition to keep prices down. Instead, a regulator like Ofgem can set Allowed Revenues for a monopoly such as a network company to restrict the amount of money that can be earned over the length of a price control period.

B

Balancing Services Use of System Charges

The Balancing Services Use of System (BSUoS) charge recovers the cost of day to day operation of the transmission system. Generators and suppliers are liable for these charges, which are calculated daily as a flat tariff across all users. The methodology that calculates the BSUoS is set out in Section 14 of the CUSC.

Behind the Meter

Behind the Meter refers to generation which is located beyond the point at which the customer's electricity use is measured. For example, this could include solar panels on a domestic property, or a backup generator installed at a factory.

C

Capacity Market

The Capacity Market (CM) provides a regular retainer payment to reliable forms of capacity (both demand and supply side), in return for such capacity being available when the system is tight.

Common Distribution Charging Methodology

The Common Distribution Charging Methodology (CDCM) sets the average charges for high-voltage and low-voltage customers' use of the distribution system. The CDCM was jointly developed by the UK's Distribution Network Operators.

Connection and Use of System Code

The Connection and Use of System Code (CUSC) is the contractual framework for connection to, and use of, the National Electricity Transmission System (NETS). National Grid is the Code Administrator for the CUSC and maintains the Code.

D

Dispatch

Dispatchable generation is generation whose power output can be turned on or off, or adjusted according to a dispatch arrangement to maintain the balance between generation and demand. Great Britain uses a 'self-dispatch' mechanism. Under this approach, resources (buyers and sellers of electricity) determine a desired dispatch position for themselves based on their own economic criteria to provide commercial independence within a market.

Distribution Network

Electricity distribution networks carry electricity from the high voltage transmission grid to industrial, commercial and domestic users.

Distribution Network Operator

Distribution Network Operator companies own and operate the distribution network of towers and cables that bring electricity from the transmission network to homes and businesses. They do not sell electricity to consumers, this is done by the electricity suppliers. There are 14 licensed distribution network operators (DNOs) in Britain, and each is responsible for a regional distribution services area.

E

Extra High Voltage Distribution Charging Methodology

The Extra High Voltage Distribution Charging Methodology (EDCM) sets site-specific charges for customers connected to the Extra-high Voltage network and customers connected at the lower voltage busbars of Extra-high Voltage and High Voltage transformers. The EDCM was fully implemented in April 2013

Embedded Benefits

Embedded benefits are the payments which smaller (sub-100MW) Embedded Generators get, and the charges they do not have to pay, compared to larger (over 100MW) EG on the distribution system and transmission connected generators.

Embedded Generators

Also called EG, distributed generation, and distribution-connected generation. These are generators connected to the distribution system, rather than the transmission system. Smaller (sub-100MW) EG do not pay transmission charges and can receive Embedded Benefits. Larger (over 100MW) EG do pay transmission charges and do not receive Embedded Benefits.

H

Half-Hourly / HH

A form of interval energy data. Some metering equipment can measure energy on a half hourly (HH) basis and where this is the case, network charges can be levied on a half-hourly basis.

I

Intermittent

A generator or source of energy/electrical power whose energy source cannot be made available on demand (for example due to a factor outside of direct control such as the weather).

N

Non-intermittent

A generator or source of energy/electrical power whose energy source can be made available on demand.

O

Ofgem

Ofgem is the Office of Gas and Electricity Markets. Our governing body is the Gas and Electricity Markets Authority and is referred to variously as GEMA or the Authority. We use 'the Authority', 'Ofgem' and 'we' interchangeably in this document.

S

Scaling

Scaling is the method by which distribution network demand charges are adjusted so that, in aggregate, the charges in a DNO area recover the DNO's allowed revenues. The difference between the outputs of the cost models and the DNO's allowed revenues is reconciled by adjusting pre-scaled charges (upwards or downwards) to arrive at a set of charges which generate a revenue stream equal to the DNO's allowed revenue.

Security of Supply

Security of supply is ensuring the uninterrupted availability of energy sources at an affordable price. National Grid publish an outlook report on the availability of gas and electricity supplies ahead of each winter. The report contains an assessment of the risk to suppliers in Britain over the next winter.

Significant Code Review

The Significant Code Review (SCR) process provides a tool for the Authority to initiate wide ranging change and to implement reform to a code-based issue. The

Authority would consult before deciding on whether to undertake an SCR and consider the responses to the consultation before deciding on whether or not to launch an SCR.

T

Transmission Network

The transmission network comprises of circuits operating at high-voltage, defined as; 400kV, 275kV, and 132kV (in Scotland only). The system is responsible for the transmission of energy from Generators to lower voltage distribution networks, which subsequently distribute the supply to users. National Grid is responsible for managing the operation of both the England and Wales transmission system, the high voltage electricity transmission network in Scotland, and the high voltage networks located in offshore waters surrounding Great Britain.

Transmission Network Use of System Charges

Transmission Network Use of System Charges (TNUoS), also called Transmission Use of System Charges (TUoS) charges. These charges recover the costs of the Transmission Network and are charged to both demand users and generators. They are broadly separated into locational charges, which relate to the incremental cost of using the network in a specific location, and residual charges that recover the remaining costs and are non-locational.

TNUoS Demand Locational

TNUoS Demand Locational charges are locational specific, cost reflective, charges of an incremental, forward-looking nature that are levied on demand users.

TNUoS Demand Residual

TNUoS Demand Residual (TDR) charges are top-up charges which ensure that the appropriate amount of allowed revenue is collected from demand users once locational, cost reflective, charges have been levied. The amount of revenue which needs to be recovered from TDR charges does not change when individuals use the system differently. Any TDR charges avoided by the use of smaller EG have to be recovered from other users of the network, leading to higher charges for everyone else.

TNUoS Generation Locational

TNUoS Demand Locational charges are locational specific, cost reflective, charges of an incremental, forward-looking nature that are levied on generators.

TNUoS Generation Residual

TNUoS Generation Residual (TGR) charges are top-up charges which ensure that the appropriate amount of allowed revenue is collected from generators users once locational, cost reflective, charges have been levied. If too much revenue has been collected from the locational charges, the TGR can be a negative charge that pays revenue back to generators.

Transmission Owners

The high-voltage electricity transmission network in England and Wales is owned by National Grid Electricity Transmission plc (NGET), in south and central Scotland it is owned by Scottish Power Transmission plc (SPT), and in north Scotland by Scottish Hydro Electric Transmission plc (SHET). These companies are designated as Transmission Owners (TOs) in legislation.

Triad Periods

The Triad refers to the three half-hour settlement periods with highest system demand between November and February, separated by at least ten clear days. National Grid uses the Triad to determine TNUoS charges for customers with half-hour metering. The Triads for each financial year are calculated after the end of February, using system demand data for the half-hour settlement periods between November and February.

Appendix 3 - Feedback on this consultation

We want to hear from anyone interested in this document. Send your response to the person or team named at the top of the front page.

We've asked for your feedback in each of the questions throughout it. Please respond to each one as fully as you can.

Unless you mark your response confidential, we'll publish it on our website, www.ofgem.gov.uk, and put it in our library. You can ask us to keep your response confidential, and we'll respect this, subject to obligations to disclose information, for example, under the Freedom of Information Act 2000 or the Environmental Information Regulations 2004. If you want us to keep your response confidential, you should clearly mark your response to that effect and include reasons.

If the information you give in your response contains personal data under the Data Protection Act 1998, the Gas and Electricity Markets Authority will be the data controller. Ofgem uses the information in responses in performing its statutory functions and in accordance with section 105 of the Utilities Act 2000. If you are including any confidential material in your response, please put it in the appendices.

General feedback

We believe that consultation is at the heart of good policy development. We are keen to hear your comments about how we've conducted this consultation. We'd also like to get your answers to these questions:

1. Do you have any comments about the overall process of this consultation?
2. Do you have any comments about its tone and content?
3. Was it easy to read and understand? Or could it have been better written?
4. Were its conclusions balanced?
5. Did it make reasoned recommendations for improvement?
6. Any further comments?

Please send your comments to stakeholders@ofgem.gov.uk