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For the attention of Judith Ross  
Energy Systems Integration

Dear Judith ,

**Targeted charging review (TCR) consultation (residual charges)**

We include our response to your recent consultation.

We address the specific questions raised in your consultation. We also provide comments related to the assumptions made with respect to residual charges that we believe warrant further investigation before a decision on how to allocate such charges can be made.

Our response is largely based on our understanding of the Common Distribution Charging Methodology (CDCM) as this is the area we are most familiar with. We have not commented specifically to transmission charging but our responses may apply to transmission as much as they apply to distribution charging.

Edinburgh Economics Ltd is responding in an individual capacity and we do not represent any other organisation in this regard.

Edinburgh Economics Ltd regards this response as non-confidential and has no objections to it being placed in the public domain.

Best regards

**Keith Burwell**

Edinburgh Economics Ltd

## 1 Assumptions behind residual charging

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- 1.1 The consultation document is founded on several assumptions and established charging methods which we believe need to be investigated further. These include:
- The assumption that the difference between allowed revenues and the assumed cost-reflective element, based on incremental or quasi-incremental cost models, is largely attributable to stranded or under-utilised assets.
  - The incremental cost models (especially the 500MW model behind the CDCM) that are designed on a demand only basis may not capture the effects of latest technological developments, in particular the impacts of embedded generation and storage.
  - The move away from deep connection charges that has shifted the burden of financing assets, some of which may end up being under-utilised or stranded, to the wider customer base rather than borne by those that triggered the investment in the first place.
  - The rationale behind the allowed revenues that the companies are entitled to receive as part of the price control process and the impact of efficiency out-performance resulting in higher returns than envisaged.
  - The wider rationale that secures the network companies' allowed revenues regardless of whether their investment decision making is subsequently proved to be sub-optimal; should they shoulder a degree of risk?
- 1.2 We briefly discuss these issues below.

### Do residual charges represent stranded and under-utilised assets?

- 1.3 The consultation document (paragraph 2.4) suggests that residual charges largely cover the costs associated with stranded and under-utilised assets. We are not convinced of this argument.
- 1.4 A feature of the CDCM is that 40% of the indirect costs are not allocated to pre-scaled charging elements and therefore must be recovered through scaling. The recently withdrawn DCUSA Change Proposal (DCP) 284 examined this aspect. The work group's consultation document (12 October 2016) set out these costs relative to scaling. For 2016-17 charges total scaling across the 14 DNOs amounted to £1,618 million which included £571 million in indirect operating costs, 35% of the total value of scaling.
- 1.5 The negative value of scaling for UKPN London, and UKPN Eastern after 40% of indirect costs described above is taken into consideration, cannot be explained by stranded and under-utilised assets.
- 1.6 The value of residual charges is the difference between two numbers: the allowed revenue in a given year and the value of the forward looking 'cost-reflective' component of charges derived through models such as the 500 MW model behind the CDCM. The allowed revenue can fluctuate year on year through the annual iteration process. These fluctuations are not always passed through to the forward looking component which is relatively stable by comparison. The net effect is that residual charges can fluctuate even though the degree of stranded and under-utilised assets may not have changed. Total charges for distribution fell from £5,378 million in 2016-17 to £5,235 million in 2017-18, a fall of £143 million. The corresponding residual charges fell from £1,618 million to £1,437 million, a fall of £181 million. Consequently much of the fluctuation in residual charges is attributable to variations in allowed revenues and therefore not necessarily due to stranded or under-utilised assets.
- 1.7 We feel that a greater understanding of what the residual charges actually represent is needed before a decision can be reached as to how they should be allocated.

### Are the forward looking models reliable representations of forward looking costs?

- 1.8 The CDCM uses a quasi incremental cost model, often referred to as the 500 MW model. This is a scaled down version of the actual DNOs' networks and are used primarily to determine a cost per MW at system peak demand. The CDCM then allocates other charges such as direct and 60% of indirect costs to determine the forward looking charges before scaling. A feature of the 500 MW model is that it does not consider distributed generation. This is not an omission but rather a reflection of the relatively small impact of embedded generation at the time the CDCM was developed. We understand that the design and application of the 500 MW model is a subject of the ongoing industry led CDCM review.
- 1.9 The 500 MW model is applied in the CDCM to derive charges at system peak demand (the 'red' charging period). This assumes that it is peak demand only that drives investment in the network. It does not take into consideration other phenomena such as peak generation and the impact of storage which can influence network investment. Incorporating these factors in the 500MW model may drive the forward looking costs up or down which in turn will influence residual charges.
- 1.10 The 500 MW model is based upon conventional reinforcement solutions to satisfy demand and does not consider new innovative techniques that could be used to defer or avoid reinforcement. The charges derived may not necessarily reflect the actual costs of satisfying incremental demand.
- 1.11 The 500 MW model assumes that demand outside of the red period has only limited influence on forward looking costs and therefore the pre-scaled charges in the amber and green periods are significantly lower than those applicable to the red. This suggests that consumers who consume energy in the amber and green periods impose little or no costs on the network. It is arguable that such an arrangement may not necessarily be a true reflection of how costs are imposed. The CDCM review working group is considering a revised 500MW model to be broken down into two models. The 500MW model would remain largely as is to determine charges at system peak whereas another model, say 200MW, would determine pre-scaled charges in the amber and green periods based upon the minimum size of network necessary to meet demand in those periods. This would leave the red charges largely unchanged but would increase charges for amber and green, which, in turn, will reduce residual charges. The recent decision on DCP 228 that reallocates scaling across the three time bands rather than predominantly on the red time band in part recognises that consumption in the amber and green periods do impose costs but whether these costs relate to stranded or under-utilised assets is debateable.

### What is the impact of the connection charging arrangements on residual charges?

- 1.12 The current shallow-ish connection charges arrangements make the connecting consumer responsible to fund a portion of the costs of network reinforcement associated with the connection leaving the wider consumer base to fund the balance in the allowed revenues and charged through use of system charges. If at some time in the future such reinforcement is found to be stranded or under utilised the wider consumer base bears the related costs until the assets are fully depreciated. This would certainly be the case for a generator with a useful life of circa 20 years that is not replaced at the end of its useful life, whereas the assets developed for that generator may have a useful life of 40 years or more. With deep connection charges the costs of stranding would be borne by the consumers who triggered the reinforcement in the first place and therefore remove from other consumers the costs of any subsequent stranding or under-utilisation. A return to deep connection charges may, over time, reduce the scale of residual charges from what they would otherwise be. We feel that an examination of residual charges cannot be done in isolation of the connection charging arrangements.

### How does RIIO affect residual charges?

- 1.13 The base allowed revenues are derived from the business plans underpinning the RIIO price controls. These plans assume a return on regulatory equity (RORE). Although the RIIO price control framework is set to provide challenging but achievable levels of performance from the network companies there is an expectation of out-performance relative to the business plans which may

increase RORE. The 500MW models, on the other hand, determine pre-scaled charges on the basis of the rate of return and a large degree of the operating costs as set out in the base price control. The effect of out-performance relative to the business plan is that the allowed revenues may will remain largely unchanged (except for that proportion of out-performance that is shared with consumers) as will the forward looking pre-scaled charges and the residual charges. Where does the additional RORE lie? If the forward looking costs are considered to be efficient and reflect actual costs then the additional RORE may lie within the residual charges component. Alternatively the forward looking models may be overstating costs and the additional RORE will fall in that component.

- 1.14 If residual charges are, in fact, driven by stranded and under-utilised assets then, if in a steady state condition, over time they should reduce as such assets are fully depreciated and fall out of the equation. A continuation of the fall in demand may offset this effect and may even result in a greater level of stranding or under-utilisation. Similarly, if demand was to increase, e.g. through the take up of electric vehicles, some of the previously stranded or under-utilised assets could be more efficiently employed and the degree of stranding or under-utilisation could lessen.
- 1.15 Although the eight year RIIO price control period provides regulatory certainty and comfort to investors it is possibly too long to adequately foresee all the technological innovations that can benefit the networks. Even if the companies can see opportunities for improved efficiency through such innovation they may not necessarily share them with the Authority when submitting their business plans. Within such a rapidly changing environment a shortened but more predictable price control period may be appropriate to protect consumers against excessive levels of residual charges.

#### **Should network companies bear some of the risk of stranded and under-utilised assets?**

- 1.16 Although connection charges and some use of system charges may provide economic signals to investors regarding where and how to connect, there are limited incentives for the network companies to work with them to achieve optimum system use. If consumers are prepared to meet the connection and use of system charges the network companies will accommodate them. If the network assets built to accommodate these new connections are subsequently found to be under-utilised the consumers bear a portion of the associated costs. The network companies are insulated against poor investment decision making. With a future enhanced role of the DNOs to become local system operators (DSOs) would it be appropriate to allocate investment decision making risk to them in exchange for a higher return on capital? This could take the form of DNOs bearing some of the costs of under-utilisation which in turn may reduce residual charges. This could create an incentive for DSOs to work more closely with consumers, including generators, to ensure that new connections are made in the location and manner that provides optimum benefit to them and all other consumers. In the longer term this may result in reduced residual charges.
- 1.17 We agree that such an approach is well outside the scope of this consultation but we feel that the future system operation role of the DNOs needs to be considered in the design of network charges including how to allocate residual charges.

#### **Our opinion on future arrangements for residual charges**

- 1.18 We are not convinced that a review of how residual charges are recovered from consumers can be undertaken in isolation of a root and branch review of the overall charging arrangements, including connection charges. The TCR assumes that the allowed revenues and the forward looking cost recovery models, the difference between them being the amount to be recovered through residual charges, and the connection charging arrangements are sound. We believe that the time is ripe for these elements to be reviewed alongside the residual charging arrangements.

## 2 Responses to consultation questions

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**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?**

- 2.1 We agree that residual charges should not fall disproportionately on those unable to avoid charges. The current arrangement where charges, including residual charges, for the majority of non half-hourly settled consumers are allocated to kWh of net consumption is failing. This is not confined to residual charges but all charges.
- 2.2 For example, a domestic consumer with solar PV will reduce overall network charges even though that consumer's demand at system peak (winter evening) may be no different to a similar consumer without solar PV (unless it includes storage). In the extreme, with the introduction of storage behind the meter, many consumers could enjoy the security of the network at little or no cost and the majority of the network costs, which is largely fixed, would fall on to an ever decreasing consumer base.

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

- 2.3 It is probable that the consumers that are most exposed to the risk of bearing higher charges as a result of others able to avoid charges are also the most vulnerable consumers. This includes poor households that are unable to afford to take action to avoid charges or those living in poor housing stock where high energy consumption is unavoidable. Households that are not connected to the gas grid and use electricity for heating, a common feature in retirement accommodation, may also pay a disproportionate level of network charges including residual charges.

**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.**

- 2.4 DCP 228 goes a long way to resolving the current disproportionate allocation of residual charges. We do not see any further actions that need to be taken in advance of an SCR.

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

- 2.5 There is no single right or wrong approach and all options have advantages and disadvantages. The current approach of residual charges being recovered through unit charges disadvantages those consumers unable to reduce net consumption through the use of behind the meter generation and storage. A charging system based more on capacity or gross consumption appears to be more appropriate, although the latter would prove difficult to implement.
- 2.6 The capacity charge approach based on fuse size as applied in the Netherlands has the advantage of simplicity and protects consumers who are unable to avoid charges from bearing an ever increasing cost burden due to the actions of others that can avoid charges. This approach could encourage some consumers to reduce connection capacity by moving generation behind the meter. Although this may seem beneficial, in that it will free up network capacity elsewhere in the network, it could reduce their security of supply.
- 2.7 The Netherlands approach could still result in higher costs on vulnerable consumers who consume very little but will be subject to a capacity charge based on a minimum fuse size for their type of dwelling. Protections for vulnerable consumers, e.g. through tax and benefits, may be necessary.
- 2.8 With the widespread adoption of smart meters it may be possible in the future to bring non-half hourly settled consumers in line with half hourly settled consumers and introduce capacity charges (p/kVA) as well as fixed (p/day) and unit (p/kWh) charges. The capacity charge could be based on fuse size, as used in the Netherlands or based on actual (ex-post) maximum actual capacity. The latter option would provide incentives for consumers to reduce their peak demand but it would only work if the consumer could identify the price signal and benefit by responding to it, i.e. the

consumers' bills should clearly set out how much they are charged for capacity and provide information as to how such charges could be reduced. We accept that the complexities of such a system could rule it out in the short term.

- 2.9 To take the capacity charging concept further the half-hourly metering capability of smart meters could, in the future, enable a two tier capacity charge, one capacity charge for the red periods and another for capacity in green and amber periods. These could be included in capacity agreements or, in the case of smaller consumers, be charged according ex-post metered maximum capacity. Such an arrangement may benefit storage should they confine import to the green and amber periods. This could be further enhanced by the introduction of seasonal charges although this could place a heavier cost burden on vulnerable consumers at times when they are most dependent on electricity, i.e. winter evenings.

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

- 2.10 Nil response.

**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.**

- 2.11 We agree with the proposed principles for assessing options for residual charges but we wish to propose a further principle, that of encouraging efficient behaviour by the DNOs.
- 2.12 We agree that the allocation of residual charges should not reduce distortions as this is necessary to ensure efficient decision making in relation to where, when and how to access the network. On the (questionable) rationale that residual charges are largely attributable stranded and under-utilised assets the charging framework should be designed to discourage activities that could lead to further stranding or under-utilisation. This includes influencing both consumer and DNO behaviour.

**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?**

- 2.13 We recognise that distribution connected generation and storage can have an increasing impact on the transmission system, both positive and negative. The costs or benefits to the transmission system should be allocated to these users accordingly. The current framework does not provide for transmission charges to be imposed on distribution connected generators below 100MW. The ever growing influence of distribution connected generators on the transmission system may prompt the need for transmission charges to apply to them in the future, possibly including residual charges.
- 2.14 The forward looking costs and benefits may be determinable through existing models but the proper allocation of residual charges may be significantly more complex to determine. If the assumption that residual charges are a reflection of stranded and/or under-utilised assets is valid then it is rational to impose residual charges on those consumers that either triggered the investment in the assets in the first place or allocate them to those that are responsible for the stranding or under-utilisation. For example, an embedded generator could render some existing assets redundant and therefore it may be appropriate for it to bear apportion of the cost of that redundancy, although in practice such an arrangement could prove to be impracticable.
- 2.15 We therefore cannot suggest an appropriate allocation of residual charges across different system users. Despite the complications we agree that the allocation should, as far as possible, limit distortions in cost-reflectivity.

**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?**

2.16 Refer to our answer to question 7 above.

2.17 Aside from charging users of the network we believe that the DNOs themselves could bear some of the risk associated with residual charges to reflect the quality of their investment decision making.

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

2.18 We agree that the current arrangement where the majority of transmission and distribution network charges, including residual charges, are allocated on net (kWh) consumption basis (option A) is failing and needs to be changed.

2.19 We support the concept of fixed prices (option B) and/or connected capacity (option C). These are both forms of fixed charges. The fixed charge and/or capacity approach should not necessarily be confined to residual charges but all network charges. As we have pointed out above, residual charges change year on year through the iteration process. Fixed total network charges would significantly reduce volatility as they would recover allowed revenues (stable and predictable) from customer numbers and/or total capacity (also stable and predictable). Price stability and predictability helps consumers' own investment decision making. We agree that the downside to these options is that they do little by way of providing price signals to better manage demand. We are not convinced that price signals for what is a small component (circa 25%) of overall electricity charges are strong enough to have a material effect on behaviour, except in the case of larger half-hourly settled consumers. The wider economic benefits of simpler, predictable and stable charges may, overall, outweigh the benefits of price signals delivered through kWh charging. This warrants more detailed investigations.

2.20 Gross kWh consumption approach (option D) has its merits but this only resolves the issue of behind the meter generation. This arrangement would reduce the incentives to install behind the meter generation even if, when used with storage, it could reduce the consumer's capacity and hence benefit the wider network.

2.21 The hybrid approach (option E) effectively comprises options B or C but offers protection to low demand consumers. This approach is largely political in nature and has little or no economic rationale. As the consultation document suggests, this option still results in residual charges increasingly falling on those consumers unable to manage demand and/or capacity through domestic generation and storage.

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

2.22 We believe that in the longer term the TOs and the DNOs themselves could bear some of the risk, and hence some of the cost, of stranded and under-utilised assets. This would reduce the overall allowed revenues and hence the residual charges. In exchange the return on capital they would receive in the price controls may need to be adjusted to reflect the increased risk. This is not a change that can be introduced suddenly but could be developed over time to gradually transfer risk from consumers to the TOs and the DNOs.

**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')?**

2.23 The consultation document for questions 12 to 15 relate to transmission charges. It does not discuss the impact that EG can have on distribution charges and whether the existing distribution charges for EG are appropriate, in particular the current arrangements where generators are largely exempt from incurring residual distribution charges. Our comments below largely reflect our opinion in relation to the distribution charging arrangements for EG.



- 2.24 We agree that EG is distorting the charging arrangements. In particular, the demand only models used for determining the incremental costs before scaling do not adequately capture the effects of EG on distribution charges. If the costs they impose on the networks (or the benefits they provide) are demonstrated to be different to those determined in the current models then this would have an impact on the residual charges overall. We agree that much more work is needed to determine the effects that EG has on the networks and their associated costs.

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

- 2.25 We are not convinced that EG should remain largely exempt from incurring residual charges. In some cases they may be the cause of residual charges.
- 2.26 The shallow-ish connection charges may be a contributing factor behind residual charges. A return to deep connection charges, including EG, could reduce residual charges and should be considered as part of further analysis.

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

- 2.27 The largest benefit, TDR payments, would appear to be the higher 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?**

- 2.28 Small, behind the meter EG, for non-half hourly settled consumers, are disadvantaged in that they cannot enjoy the benefits of shifting demand from the network from peak to off-peak periods.

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

- 2.29 The current distribution charging arrangements provide generators, including storage, with credits to their forward looking cost reflective elements that are basically a negative value of the demand charges (at the next highest voltage level). We are not convinced that this is an accurate reflection of the benefits they provide. Further work is needed to determine the forward looking benefits (or costs) of generation, including storage, which may have an impact on the residual charges.
- 2.30 The recently withdrawn DCUSA Change Proposal (DCP) 284 examined the validity of applying residual charges to generation. The proposal suggested that generation should be entitled to negative residual charges whereas some members of the working group considered that generators should be subject to positive residual charges. We believe that the motivation behind the proposal was to favour storage by offsetting some of the residual demand charges. The working group minutes reveal wide differences of opinion related to residual charges. More analysis is needed before any decisions are made.
- 2.31 We are not convinced that storage should not pay the current distribution demand residual charge. Unless storage facilities are committed to not take energy at peak times they should bear their share of charges, including residual charges. Recent research by UKPN<sup>1</sup> suggests that storage facilities generate income from ancillary services, which can be called upon at any time including at peak demand periods. The income generated from arbitrage trading is small in comparison. For storage to compete with other providers of ancillary services that use the network they should pay their proportion of charges, including residual charges.
- 2.32 The consultation document (paragraph 8.5) suggests that storage is not the end user of power, unlike demand consumers. This is not necessarily true. Storage facilities consume power through energy losses in the storage process. If storage is to be exempt from demand residual charges the

<sup>1</sup> [http://innovation.ukpowernetworks.co.uk/innovation/en/Projects/tier-2-projects/Smarter-Network-Storage-\(SNS\)/Project-Documents/UKPN+SNS+2+Dec+final+learning+event+presentation+slides.pdf](http://innovation.ukpowernetworks.co.uk/innovation/en/Projects/tier-2-projects/Smarter-Network-Storage-(SNS)/Project-Documents/UKPN+SNS+2+Dec+final+learning+event+presentation+slides.pdf)



exemption should only apply to the energy exported from the site, i.e. residual charges should still apply to the energy consumed in the storage process.

- 2.33 It is not clear in the consultation document how the exemption would apply. Would this apply to all demand on the site or just that demand used to charge the storage apparatus? The growing uptake of domestic storage, including electric vehicles, could lead to requests that demand from such consumers should be exempt from residual charges also.
- 2.34 If there is to be an exemption of demand residual charges for storage firm definitions of what constitutes a storage consumer to qualify for such an exemption are needed. There is a risk that demand consumers may exploit such exemptions, e.g. adding a nominal amount of storage in their facility to qualify for the exemption on some or all demand rather than for the benefits that storage could offer to the business.
- 2.35 Any reduction in residual charges for one group of consumers will lead to an increase in residual charges for other groups. Exempting storage from demand residual charges may therefore distort the forward looking cost reflective differentials.

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

- 2.36 Nil response

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

- 2.37 Nil response

**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?**

- 2.38 We believe that the issues surrounding charging for storage consumers is so complex that it is not feasible to address residual charges for storage in isolation of the wider charging arrangements for this group of consumers.
- 2.39 We do not agree that the changes made to residual charging for storage can be effectively delivered through the standard code change process. We believe that changes to residual charging for storage should form part of a wider review of the overall transmission and distribution charging arrangements.

**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.**

- 2.40 We support the concept of a CCG. However, we believe it requires more than just Ofgem and industry representation. We believe that other interested parties, including consumer representation organisations, need to be involved.

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

- 2.41 A wider review, not confined to residual charges, that we believe is necessary may require a more robust delivery model. We do not believe that the changes necessary can be delivered without extensive and time consuming debate. Maintaining momentum in the process will be a significant challenge.

**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?**

- 2.42 We agree that the changes necessary can best be delivered through an SCR.