Next steps in delivering the electricity distribution structure of charges project

A response to Ofgem's 11th December 2008 consultation paper 160/08

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Introduction

Ofgem's consultation paper of 11th December 2008 invites the views of interested parties concerning its proposed approach to introducing a common charging methodology and governance arrangements for distribution use of system charges. In particular it seeks comment on the next steps it should take in delivering the project, and opinions on the approach outlined in its Decision paper of 1st October 2008.

Both the University of Bath and DLT Consulting have taken an active interest in the development of network charging arrangements. We are therefore pleased to have the opportunity to respond to the questions and issues raised by Ofgem in both these documents.

A Common Methodology

We are of the view that there would be many benefits from the adoption of a common methodology by all distribution businesses in the derivation of use of system charges. In particular it would:

- Create a consistent approach to the derivation of charges, both temporally and geographically, which should help reduce disparities in the costs and benefits to users when making decision concerning the location of new generation and load, and the utilisation and closure of established generation and load.
- Reduce the administrative costs of suppliers by simplifying cost validation and billing systems.
- Streamline the governance of variations to established methodologies by reducing the degree of regulatory oversight that is necessary, and the number of associated consultations.
- Assist customers in gaining an understanding of the methodology that determines their charges.

It has been suggested that adopting a single methodology will stifle innovation in further development. We would not agree with this view. There is no evidence that the use of different methodologies has facilitated the development of methodological changes that will better suit the changing needs of the system or its users. Indeed the history since the inception in 2000 of Ofgem's project to revise the distribution charging methodology is that the existence of a multiplicity of approaches has frustrated development. It is our view that a common methodology with appropriate governance for its further development offers the best prospect for ensuring that the charging methodology can be kept aligned with changing market needs.

EHV networks

The Decision paper of 1st October contemplated two charging methodologies for application to distribution networks at EHV. FCP and LRIC are seen as the only prospective candidates in replacing the DRM in its many variants for deriving EHV use of system charges. Both approaches incorporate the radical change of basing charges on the results of AC power flow modelling of the extant system. This is a radical departure from the DRM that derives charges on the basis of a hypothetical network and a cost attribution method that does not reference the in situ network or its utilisation. Employing power flow modelling to assess the capability of the existing system to accommodate generation and load creates a major opportunity to move to a nodal system of pricing that can convey an economic signal for locating generation and load at different points of the distribution network in terms of the resource needed to accommodate these users.

The FCP methodology, whilst using AC power flow modelling to assess the future need for reinforcing parts of the network, ignores the opportunity for calculating nodal prices that will convey a signal of economic efficiency. Instead the approach effectively allocates assumed future costs to parts of the network where capital expenditure is anticipated given the assumptions in the modelling.

By contrast LRIC takes an objective approach to determining the impact of generation and load on the network by assessing as part of the power flow calculation the result of adding an increment of demand and generation at each node, and then determining the consequence for the reinforcement costs that result In this respect the approach is founded on the same general approach as the ICRP methodology employed in transmission pricing. Since 132 kV is an EHV distribution voltage in England and Wales but a transmission voltage in Scotland and offshore this would seem a useful attribute in bringing some measure of consistency between the pricing arrangements for these networks. We are somewhat puzzled that National Grid has not taken a closer interest in the LRIC methodology for the transmission 132 kV networks in Scotland and offshore since it has the major advantage over ICRP that it takes account of the utilisation of assets and the lumpiness of future investment in deriving the nodal price signal. ICRP has the inherent weaknesses that it intrinsically assumes that existing assets are fully utilised and that additional flows in the network will require immediate reinforcement, and that the consequent investment can be undertaken in infinitesimally small increments.

The 1st October Decision paper notes that although LRIC is computationally complex, because it requires an AC power flow model of the system, it is based on a relatively simple and straightforward principle. The approach creates the pricing signal by determining the change in the present value of the future expenditure that is required to reinforce the network as a result of adding an increment of load or generation at each system node. As the Decision paper notes this should encourage economic efficiency by promoting the efficient use of existing assets, and signal load and generation to site appropriately. We believe these are important and essential attributes in the support of policies for a lower carbon economy and tackling climate change.

A significant proportion of distribution assets are approaching the end of their economic life and will require replacement. It is also anticipated that the nature of distribution systems will require significant investment to enable them to accommodate the growth in distributed generation that is also part of the move to reducing emissions and improving energy efficiency. A pricing methodology that encourages generation and load to locate and be utilised such that it promotes more efficient investment in network reinforcement and asset replacement will help place a downward pressure on prices.

The LRIC methodology is in a state of evolution. The University of Bath is engaged in an EPSCR funded research project into economically efficient charging methodologies for systems with significant intermittent generation. This project has the LRIC approach at its core and is supported by 10 postgraduate doctorate students and research assistants. One distribution business has implemented the methodology for its EHV networks, and two others have made proposals regarding its application to their systems.

The LRIC methodology has been criticised on a number of grounds, although some of these may have been overtaken by subsequent developments to the methodology. It is clear that the mathematical expression of the method will not cover all conceivable circumstances but it does appear capable of encompassing most situations either in its current or a modified form.

The Decision paper proposes a number of assumptions and workarounds that will enable the methodology to be applied in a consistent manner across all distribution businesses. This creates a useful starting point for the roll-out of the approach but it should be possible to improve on many of the limitations proposed in due course. We comment below on some of the concerns that have been raised.

- *Volatility in nodal prices.*
A nodal system of pricing will inevitably display volatility when there is a substantial change in the demand or generation connected at a particular node. This is a strength of the methodology in that it effectively portrays the consequence of a perturbation in the mix of generation and load at any point on the network. The Ofgem paper suggests that DNOs should be prepared to offer products that can hedge uncertainty in the development of their networks and give the customer the choice of smoothing the financial impact of sudden cost changes at individual locations. Offering longer term fixed price products for use of the system would seem a useful development. Publication of sufficient information to make the methodology both transparent and predictable would assist users to value such products. However, such products should not mask the underlying price signals which will be important in influencing future customer decisions.

- *High charges at low demand growth rates.*
The primary duty of a distribution business is to provide connectivity to its customers so that load can be supplied and generation purchased. DNOs will be obligated to maintain that connectivity with the designated security. The LRIC methodology identifies the cost of perturbing the underlying costs of maintaining that connectivity against the expected cost of asset replacement and system reinforcement to cater for underlying load growth in demand. It has been pointed out that for assets that are highly utilised but where the underlying growth is very small then simplistically computed LRIC charges can appear excessive. This is because under these circumstances, and taking into account the lumpiness of investment, the nodal increment would have a large impact on the investment in the modelled network.

Ofgem has proposed that an underlying growth rate of 1% should be assumed which is sufficiently great to obviate this possibility. This would appear a pragmatic solution to facilitate the introduction of the methodology and is to be welcomed. However, a latent strength of LRIC is that it can reflect in prices the consequence of differential growth rates in different parts of the system. If there is a weakness in the approach at very low growth rates it is more associated with the nature of the reinforcement that is assumed to be undertaken when investment is triggered. A simple doubling of assets, which is the general investment assumption in most LRIC models, would not be appropriate for very low growth rates since the utilisation of the new asset would never become significant. In developing the methodology into the future more sophisticated investment algorithms need to be developed to cater for these circumstances.

- *Short investment horizons*

Similarly if the utilisation of an asset is particularly high then the application of an increment at the node may create a negative horizon for the investment. Here too the mathematical expression of LRIC will produce a nonsensical result. In this case the high charge produced by the algorithm penalises the customer for a previous lack of investment by the distributor. This further demonstrates that the LRIC methodology cannot be applied blindly but must be placed in a context that is both credible and realistic. We are encouraged in this respect by a proposal in the work we have undertaken with CE-Electric in the application of the methodology to their system. This suggests that the LRIC pricing signals becomes inappropriate when the timescale for reinforcement is less than the normal planning horizons for schemes for reinforcing the system. In these cases the actual reinforcement schemes undertaken will usually be different to the standardised investment assumptions embedded in the evaluation model.

- *Negative growth rates*

It has also been suggested that LRIC cannot cater for negative growth rates. The underlying 1% growth rate proposed by Ofgem might be seen as inappropriate in circumstances if overall electricity consumption starts to decline. Recent work by the University of Bath has explored a development to the methodology that would also enable it to accommodate negative growth rates. In these circumstances the future cost is taken as being the replacement of assets by equipment of a lower rating thus producing a benefit to the system. The perturbation of this benefit by the injection or withdrawal of a MW increment is then taken as the future value of the consequence of the increment. The ability of LRIC to cope with negative growth rates could be particularly relevant where there is a growth in distributed generation, especially microgeneration.

- *Connection charges*

It has been further suggested that LRIC is not compatible with a shallow connection charging policy. The extreme disparities that can arise from a deeper connection charging policy have been seen as a barrier to entry for generation connected to the distribution system. Deep connection charges provide a strong signal for the location of new generation and load, but if the connection charges are to be shallow then the signal must flow from the use of system charges. LRIC is a particularly suitable methodology in this respect.

- *Fault levels*

Although increases in fault levels will result from the addition of both load and generation, it is generation that has the most significant effect. The University of Bath is exploring the feasibility of extending the methodology to incorporate fault level using an asymmetrical cost function that reflects better the reality of the situation. The Ofgem Decision paper notes that accommodating increases in fault levels is not currently a significant cost driver and proposes that where they are significant they could be catered for through connection charges. We would support this as an interim measure whilst the methodology becomes established, although we would also note that this may not continue to be the case as distributed generation becomes more prevalent.

- *Reactive power*

It is argued in the Ofgem Decision paper that by basing charges on kVA for EHV customers, which is the proposal, then reactive power costs will be automatically recovered. This suggestion is a pragmatic starting point but of course is a proposal that relates to the charge-out arrangements and not necessarily the derivation of the costs. Because LRIC is based on AC power flow modelling it can distinguish the incremental cost of absorbing or producing reactive power at each node from costs of active power. In this manner it can also provide an economic signal for the value of compensation at any part of the system which we believe should be the basis of reactive power charges. This is a further candidate for the development of the methodology in the future.

HV & LV Networks

Ofgem has proposed that for HV and LV networks use of system charges should be derived on the basis of the DRM. This is a view generally accepted throughout the industry and the ENA has formed a work-stream to create a version of the methodology that can be universally adopted. The development of a common methodology at these voltages is to be welcomed, but smaller distributed generation, especially small CHP plants that may become part of a wider distributed energy strategy, will often have the opportunity to connect at either HV or EHV. This creates boundary issues if the charges are produced by applying one methodology at EHV and a different approach at HV.

In principal LRIC can be applied at any voltage but the data sets and enormity of the computations that would be needed to represent the HV networks are currently seen as too daunting. This does not mean that the concept should be abandoned. The intrinsic properties of the approach to produce economic signals can apply equally at voltages below EHV. We would hope that in due course the approach can be extended to the system below the primary distribution sub-stations. Further research is needed in this respect but the use of standardised network designs to represent the existing system at these lower voltages may be a solution to taming the computational dragon.

The emergence of microgeneration on LV systems is a further prospect that warrants extending the principles of LRIC to the lowest voltages. In this context it could signal the degree to which the existing networks could accommodate economically the growth of this technology.

The DRM is a model that represents the network as a set of idealised assets of a system that the DNO expects to build in the future. It is also a vehicle that collects the costs of different parts of the system in “yardsticks” that reflect the characteristics of different groups of customers and is the starting point for constructing use of system tariffs. This second aspect is an enduring feature of the DRM and could be used to collect costs from either the 500 MW model of the “future” network which is the basis of the DRM, or the output from the LRIC calculations.

Conclusions

It remains our firm view that the adoption of a common charging methodology by all DNOs will create significant benefits for all users of distribution networks, and probably for the network owners themselves. We believe that the concepts that underpin the LRIC methodology are entirely appropriate for any revised network charging methodology at the EHV levels. We would also hope that the principles of the approach can eventually permeate the charging arrangements employed for the HV and LV parts of a distribution network.

The methodology intrinsically provides a pricing signal to users of distribution systems that should encourage load and generation to locate so as to maximise the economic use of existing assets and help ensure the efficiency of future investments. It therefore has the capability to place a downward pressure on costs and contribute towards a reduction in CO_2 emissions, which will be crucial in tackling climate change.

Research and further work on the application of the approach has developed the original exposition of the methodology such that solutions can now been seen to many of the earlier concerns and criticisms. Some of these have been explored above. The framework described in the Ofgem Decision paper provides a useful starting point for implementing the methodology on a common basis, whilst the proposed governance arrangements would provide for its subsequent development and sophistication.

It would seem essential that the debate between the FCP and LRIC approaches is resolved before any revisions to the existing charging methodologies are implemented. The choice of the EHV methodology needs to be made holistically in the context of all parts of the distribution networks and their likely future development. Whilst the use of a universal DRM for voltages below EHV is a helpful move towards a common charging methodology, and parts of the process would endure, the prospects for creating economic signals for users at HV and even LV should not be removed from any consideration of the overall charging methodology. Referral of only the EHV charging methodology would create the possibility of an enduring and perverse boundary between users connected at EHV and those connected at HV. We therefore favour a referral to the Competition Commission of the full package of measures consulted upon in the 1st October Decision paper.

Abandonment of the structure of charges project at this stage should be unthinkable.