Western Power Distribution

Consultation on potential changes to the Use Of System Methodology

Introduction

The purpose of this consultation is to:

- summarise the work that WPD has been doing on reviewing its Use of System Methodology
- seek views on the type of methodology that is most appropriate to meet our licence obligations
- highlight key parameters and assumptions in the alternative methods being considered and seek views on the appropriateness of these assumptions, and
- seek views on how the methods should be further developed where known issues have yet to be accommodated.

A decision will need to be made shortly on which, if any, alternative methodology to develop in detail in order to be able to implement any revision for 1st April 2007. In order to facilitate the smooth implementation of any new methodology we believe it is important to consider the views of users and other interested parties throughout the development process. These views will be fed back to Ofgem as part of seeking approval for any revision to our methodology.

A further consultation with users and interested parties will be undertaken once any revision to the methodology has been completed and prior to submission to Ofgem for approval. Currently, we anticipate undertaking this consultation in late spring/early summer with submission of a final methodology to Ofgem towards the end of the summer allowing, subject to Ofgem's approval, implementation from 1st April 2007.

We welcome the views of all users and interested parties in the work described here and in particular on the consultation questions in this paper.

We would like to receive your views by 17th February 2006 at the latest. Please send them to mailto:wpdpricing@westernpower.co.uk.

Background

As of 1 April 2005, DNOs methodologies must conform to the objectives set out in Standard Licence Conditions 4(3) and 4B(3). These state that methodologies should:

- facilitate the discharge of the DNO's obligations under the Act and its licence;
- facilitate competition in supply and generation, and not restrict competition in transmission or distribution;
- be cost reflective, as far as is practicable once implementation costs are taken into account and
- take into account developments in the licensee's distribution business.

The current methodology has been approved as a baseline, and is in accordance with the two stage implementation of the conclusions of the structure of charges review. Ofgem expects that the methodology will be developed in order to deliver a longer term charging framework that better meets the licence objectives.

Ofgem's November 2003 document stated that use of system charges for demand and generation regimes should be fully aligned with UoS charges established via charging models based on forward looking long run incremental cost (LRIC).

Ofgem's May 2005 document, summarising some academic reports that it had commissioned noted that the efficient charge is the long run cost on a forward looking basis since charges should influence future behaviour and investment decisions in terms of the size and location of loads. The academics also stated that the costs should be calculated on the basis of costs brought forward, delayed or avoided by changing decisions over the timing of network development and asset replacement. They noted the difficulties with pure marginal costs due to the indivisibility of plant sizes.

This consultation is part of the development of the longer term charging framework for WPD.

Review Undertaken

To assist the review of our Use of System Methodology, WPD has engaged the University of Bath to develop a model of the WPD distribution network for the purpose of evaluating different methodologies for charging users for use of the distribution system. To date, this has concentrated on the EHV networks (132kV, 66kV, 33kV and 33/11kV transformation) although future development will consider the 11kV and LV networks.

Overview of Existing Methodology

Our DUoS charges are based on the 500MW Distribution Reinforcement Model (DRM). The DRM uses an approach outlined by TA Boley and GJ Fowler in 1977 for cost reflective retail tariffs in England and Wales. The details of our current approach are contained in our use of system methodology statement, available from our web site at http://www.westernpower.co.uk under Supplier Information. The following gives an overall summary.

This model contains assets at modern equivalent prices (current costs) which are based on a scaled representation of the WPD network. Yardstick costs (£/kW) are calculated from the DRM for each voltage and transformation level.
The DRM model measures the costs of an additional 500MW of capacity at the time of peak demand and averages this cost across users at each voltage level. Therefore, the DRM represents most closely an average cost for customers at given voltage levels at peak demand within the marginal 500MW increment.

The model is used to determine yardstick costs by customer class. The contribution of a customer group to peak demand (the coincidence) is the method by which costs are divided between groups, taking into account diversity factors and load profile. This method is used because consumption for non half hourly (NHH) metered customers is not measurable at times of peak. Coincidence factors based on load research therefore form the basis for different tariffs to take account of different usage at peak.

Charges for EHV connected customers contain a site specific element associated with connection assets. At present EHV customer prices do not match the output of the model and these are covered by a transitional arrangement within the methodology.

An adjustment is made to the yardsticks to reflect the degree that connection contributions have already paid for part of the network.

Charges for generators are based on an assessment of the likely system costs associated with the connection of generators expressed in terms of £/kW. This is converted to charges at different voltage levels by using yardstick weighting from the 500MW DRM.

Charges from the above method are then scaled to achieve the required revenue. The current level of scaling required is around 15%.

<u>Advantages of DRM approach</u>

- Relatively simple in application
- Entire model capable of being published
- Recognises that some parts of the network are paid for via connection charges

<u>Issues with the DRM approach</u>

- In current format it does not provide locational signals. However the model could be developed on a regional/zonal basis. Criteria for defining the zones would need to be established and the costs separately identified.
- Assumes load flows from GSP to customer and cannot deal with reverse power flow
- A separate method needs to be used to set generator use of system charges

<u>Consultation questions</u>

- Are there further advantages or issues with our existing methodology?

<u>Overview of AC ICRP Methodology</u>

This approach seeks to determine an apportionment of the cost of all the assets used to deliver a marginal kW and kVAr at each node of the network.

Cost allocation is achieved by the following process:

- Each component of the network required to accommodate the anticipated demand and generation is costed in MEA terms.
- An AC load flow model is used to allow an incremental kW and kVAr to be injected at each node
- The degree to which each component of the network that supports the injection is established
- Locational charges (£/kW and £/kVAr) are calculated from the degree each component is used and its MEA value
- ‘Used’ capacity is calculated using the locational charges and the demand at time of system peak demand at the nodes. This is a simplifying assumption at this stage and will be reviewed during the development of the methodology.
- ‘Unused’ capacity cost is calculated as the difference between the regulatory return on the system MEA value and the used capacity
- Unused capacity cost is then allocated to all users on a £/kW basis
- Further scaling is required to achieve required revenue

To account for the EHV system being generally designed to an N-1 standard (i.e. no loss of supply for a single fault), the rating of each component is halved. The unused capacity cost is a function of residual system security redundancy and the use of standard ratings of assets. This methodology has been applied to the whole of the EHV system in WPD S Wales and resulted in ‘unused’ representing 30-50% of the charges.

11kV and LV voltage levels have not been considered under this approach and a full representation of these networks is unrealistic due to their size. Additionally, implementation of locational prices at 11kV and LV will add significantly to the administration of existing billing systems. The changes would be costly and difficult to maintain. Were this AC ICRP approach adopted there appear to be two main routes to consider for 11kV and LV systems:

- Creation of representative networks to apply this method to or,
- Continuation of a similar allocation method to that already in use and described above

The first of these is likely to be better able to produce charges for generators on a consistent basis to those for demand than the second as it can accommodate two way flows on the network.

<u>Advantages of AC ICRP approach</u>

- Treats demand and generation on a consistent basis
- Generates locational charges
- Allocates costs on the basis of usage of the network
- Similar to the transmission charging methodology.

<u>Issues with the AC ICRP approach</u>

- Depending of how the ‘unused’ capacity charge is allocated, it can result in high charges where there is low system utilisation – the WPD EHV system, like most distribution networks in Great Britain, is operated in a number of groups based on one or more Grid Supply Points. If the unused capacity cost in a group is allocated within that group, then a group with a low system utilisation will have a high unused capacity and this does not give the correct price signal. The approach proposed is to sum all the ‘unused’ capacity costs across the network and charge this out on a system wide £/kW basis. This results is some of the unused capacity costs in lowly utilised networks being allocated to highly utilised parts of the network.

- Relatively complex model makes application to a full representation of the lower voltage network impractical
- Method is allocating the costs of the underlying system model, hence the system model needs to be forward looking – we believe that it would be appropriate to use the network forecast to exist for the year that the calculated charges will apply. Information on this is already published as part of our Long Term Development Statement prepared in accordance with LC 25 of our Licence.
- Peak kW times are likely to be different to peak kVAr times

Consultation questions

- Does the AC ICRP method outlined above better achieve the licence objectives than the existing methodology?

- Are there further advantages or issues with the approach described?

- With the AC ICRP method, there is a need to allocate an ‘unused’ or non marginal charge. Is a universal £/kW or p/kWh best or should some other method be used?

- In terms of investment in the network, around 30% is associated with expansion whilst the other 70% is associated with replacement of system assets. Whilst replacement decisions can be affected by reductions in system loads, historic analysis shows this to be rare. Hence should the locational message from the AC ICRP approach be:

    - restricted to 30% of the charge ?
    - allowed to reflect whatever results from the model ? or,
    - be scaled up to reflect 100% of the charge ?

- As highlighted there are difficulties in applying the method to 11kV and LV systems. Is either of the approaches suggested appropriate or should some other method be used?

- Currently the AC ICRP method starts from demand at time of WPD system peak demand. Use of this for price setting purposes is likely to cause hunting of the peak demand as users of the network seek to avoid the peak period. Currently we are considering using an average of the top 20 peak half hourly demands to define the input to the model. This sends a strong message to users to avoid periods likely to contribute to reinforcement of the system. Views on how to define the demands used in the model are welcome.

- Parts of our system have a significant night peak. Should, and if so how should this be accommodated within the AC ICRP approach? Similarly reinforcement can be triggered by high generation output during periods of low demand – views on how to accommodate this are also welcome.

- Our connection charging methodology requires a contribution towards system reinforcement as part of the connection charge. This is not based on a physical boundary and hence is difficult to incorporate into the AC ICRP approach. Views on whether and if so how this can be incorporated are welcome.

- Should EHV (site specific) charges be subject to averaging out of unused capacity or to scaling in general?

Overview of AC LRIC Methodology

This approach seeks to calculate the difference in the brought forward costs of future network reinforcement caused by change in the demand at individual network nodes.

Cost allocation is achieved by the following process:

- Full ac load flow is undertaken on the network
- For each system asset, a load growth is applied to assess the time that reinforcement of that asset will be needed – due to the difficulties in forecasting long term localised growth of system demand a general growth rate of 1.6% has been used.
- The reinforcement cost for that asset is discounted back to today’s values – rather than developing a site specific reinforcement cost for each system asset, analysis of historic projects indicate that the cost of reinforcing a transformer is approximately the MEA value of the overloaded transformer and the cost of reinforcing an overloaded circuit is approximately 1.5 x the MEA value of the overloaded circuit. These values have been used in our method.
- The reinforcement costs for all system assets are added together
- An incremental kW and kVAr is applied to each node of the network in turn
- The load growth is reapplied and a new reinforcement timing assessed
- The reinforcement cost for that asset is again discounted back to today’s values and a new total reinforcement cost for the system is established
- The incremental cost (£/MW/yr and £/MVAr/yr) at the node is the difference between the two total reinforcement costs
- This is repeated for all nodes
- ‘Used’ capacity cost is calculated using the locational charges and the demand at time of system peak demand at the nodes
- ‘Unused’ capacity cost is calculated as the difference between the regulatory return on the system MEA value and the used capacity
- Unused capacity cost is then allocated to all users on a £/kW basis
- Further scaling is required to achieve required revenue

To account for the EHV system being generally designed to an N-1 standard, the rating of each component is halved. Special treatment of parts of the network (particularly single transformer 33/11kV substations) depending on support from lower voltage networks is needed. The unused capacity cost is a function of residual system security redundancy and the use of standard ratings of assets. To date, this method has been applied to parts of the WPD S Wales network. Where applied the unused capacity cost has represented about 30-50% of charges.

11kV and LV voltage levels have not yet been considered under this approach and a full representation of these networks is unrealistic due to their size. Additionally, implementation of locational prices at 11kV and LV will add significantly to the administration of existing billing systems. The changes would be costly and difficult to maintain. Were this AC LRIC approach to be adopted there appear to be two main routes to consider for 11kV and LV systems:

- Creation of representative networks to apply this method to or,
- Continuation of a similar allocation method to that already in use and described above

The first of these is likely to be better able to produce charges for generators on a consistent basis to those for demand than the second as it can accommodate two way flows on the network.

<u>Advantages of AC LRIC approach</u>

- Treats demand and generation on a consistent basis
- Generates locational charges
- Assesses the change in future investment needs rather than an allocation of costs

<u>Issues with the AC LRIC approach</u>

- Relatively complex model making application to a full representation of the lower voltage network impractical
- There are three main parameters associated with the method:
    - Security factor – a security factor of two (to reflect an N-1 security standard) is currently being used for most of the system, with a security factor of one for single transformer substations with an enhancement to the substation costs to reflect the cost of the supporting 11kV network. Whilst the best way to address this issue would be to model the 11kV network, as highlighted above this is impractical and we believe that the approach being taken is a good proxy for the results that would be achieved by doing this.
    - Load growth – a single underlying load growth is currently being applied. Consideration is needed of how to deal with parts of the network with zero or negative growth. We have not yet developed the methodology in this area.

    - Reinforcement costs – a general rule is needed as it is impractical to assess site specific reinforcement costs for all assets individually. A sample of historic projects indicate that typically the reinforcement of a transformer is approximately 1 x the MEA value of the overloaded transformer and the typical reinforcement cost of a circuit is approximately 1.5 x the MEA value of the overloaded circuit
- Peak kW times are likely to be different to peak kVAr times
- Local reinforcement can be triggered at times other than overall system peak (e.g. night demands in some locations and generation output at times of low demand).

<u>Consultation questions</u>

- Does the LRIC approach outlined above better achieve the licence objectives than the existing methodology?

- Are there further advantages or issues with the approach described?

- With the LRIC method, there is a need to allocate an 'unused' or non marginal charge. Is a universal £/kW or p/kWh best or should some other method be used?

- In terms of investment in the network, around 30% is associated with expansion whilst the other 70% is associated with replacement of system assets. Whilst replacement decisions can be affected by reductions in system loads, historic analysis shows this to be rare. Hence should the locational message from the LRIC approach be:

    - restricted to 30% of the charge ?
    - allowed to reflect whatever results from the model ? or,
    - be scaled up to reflect 100% of the charge ?

- The LRIC approach has three main parameters highlighted in that section. Are the approaches being used reasonable? In particular, how should parts of the network with zero or negative load growth be treated where change of the system assets for replacement purposes will occur before the assets are changed for reinforcement purposes

- As highlighted there are difficulties in applying the method to 11kV and LV systems. Is either of the approaches suggested appropriate or should some other method be used?

- Currently the LRIC method starts from demand at time of WPD system peak demand. Use of this for price setting purposes is likely to cause hunting of the peak demand as users of the network seek to avoid the peak period. Currently we are considering using an average of the top 20 peak half hourly demands to define the input to the model. This sends a strong message to users to avoid periods likely to contribute to reinforcement of the system. Views on how to define the demands used in the model are welcome.

- Parts of our system have a significant night peak. Should, and if so how should this be accommodated within the LRIC approach? Similarly reinforcement can be triggered by high generation output during periods of low demand – views on how to accommodate this are also welcome.

- Our connection charging methodology requires a contribution towards system reinforcement as part of the connection charge. This is not based on a physical boundary and hence is difficult to incorporate into the LRIC approach. Views on whether and if so how to incorporate this are welcome.

Further overall consultation question

Whilst views are welcome on any aspect of this consultation, we would particularly welcome views on the consultation questions in the above sections and the following question:

- If both the AC ICRP and LRIC approaches better meet the objectives, then which of the two better achieves them?